BLOOD PHOBIA: A COMPARISON OF PHOBICS AND NONPHOBICS AND AN EXAMINATION OF AFFECT DURING VISUAL AND AUDITORY EXPOSURE

By

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Two studies examined subjective, psychophysiologic (heart rate, skin conductance level, blood pressure), and motoric (stimulus avoidance and facial disgust expressions) responses of blood phobics and nonphobics (defined by elevated or below median Mutilation Questionnaire scores) when viewing or listening to 60 s surgical and neutral videotapes and audiotapes. Study 1 assessed several personality domains and found that phobics (n = 24) were more sensitive to their own anxiety, experienced greater distress with others' negative affect, and were generally less secure than nonphobics (n = 24). Affect was assessed during exposure to surgical and neutral videotapes followed by an audiotaped surgical or neutral description. Blood phobics had more negative affect than nonphobic controls during a surgery videotape, and phobics had greater negative affect during a surgery than during a neutral videotape.

These differences were most prominent during only one of two surgery scenes and when the surgery was presented prior to rather than following the neutral videotape. Phobics and nonphobics did not differ in affect during the neutral scene. An audiotape describing the prior surgery elicited slightly more arousal than a neutral description audiotape, but phobics and controls did not differ in affect to the description. Study 2 examined affect change to repeated presentations of a surgery videotape, and the role of preparatory descriptions in reducing negative affect. Sixty blood phobics were randomly assigned to three experimental groups. One group viewed a surgery seven times and then saw a novel surgery; these subjects habituated during repetitions and dishabituated to the novel surgery. Two other groups differed in the preparation they received prior to each of four surgery videotape repetitions. One group heard a description of the upcoming surgery, and the second group heard a neutral, control description. The prepared group had moderately less negative affect during the surgery videotapes than the control group. Individual differences in coping style influenced responding to repeated surgery scenes; among the prepared phobics, blunters increased negative affect over two presentations, and monitors reduced affect. The findings indicate the need for continued basic research of blood phobia, especially its relationship to fainting (which did not occur in either study) and its current classification as a simple phobia.

GENERAL INTRODUCTION

Classification and Epidemiology

For some individuals, exposure to blood, bodily injury, mutilation, disease, and related stimuli evokes a subjective experience of fear, disgust, or aversion; autonomic arousal; and commonly, escape from and avoidance of future encounters with the stimulus (Marks, 1988). When this stimulus-response pattern is sufficiently intense, it is termed "blood phobia" (Thyer, Himle, & Curtis, 1985), and is classified as a simple phobia in the revised third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IIIR; American Psychiatric Association, 1987).

This composite of negative subjective experience, physiologic arousal, and escape from or avoidance of exposure to blood and related stimuli emerges consistently as a unitary factor in specific fear surveys (e.g., Agras, Sylvester, & Oliveau, 1969). Additionally, fainting or syncope during exposure to blood-related stimuli is prevalent. Kleinknecht (1987, 1988a) found that 14.5% to 19.3% of college students reported a history of nearly or completely fainting. About 15% of blood donors approach syncope during or after venipuncture (Graham, 1961).

Blood phobia has been associated with reduced motivation to donate blood, avoidance of medical or dental

visits, interference with routine tests such as venipuncture, decreased desire for the care of one's own or another's injuries, and the redirection of potential health professionals from their field of interest (Lloyd & Deakin, 1975; Oswalt, 1977). Avoidance of blood-related stimuli typically is easy for most phobics; therefore, few seek treatment of their phobia. Nonetheless, this condition hinders many people from full participation in activities where blood-related stimuli occur.

Affective Responding in Blood Phobia

Emotions are best quantified by three response systems: subjective or verbal report, physiologic activation, and overt motor behavior (Lang, 1968). Subjectively, blood phobics report an uncomfortable or disagreeable affect during exposure to blood-related stimuli. Most researchers label the emotion "fear," although no studies have documented the occurrence of fear as opposed to a different emotion such as disgust. Thus, this dissertation will employ a general term such as "negative affect" to describe the subjective component of the blood phobic's experience.

Second, some blood phobics experience a physiological reaction, unique among the phobias, termed the "biphasic response," in which initial sympathetic arousal is replaced by or alternates with parasympathetic activity (Engel, 1978; Graham, Kabler, & Lunsford, 1961). Like other simple phobias, sympathetic activity includes tachycardia, hypertension, striate muscle tension, perspiration, and

increased respiration, which occur during the anticipation of or initial exposure to a blood-related stimulus. Unlike other simple phobias, however, continued exposure may yield parasympathetic symptoms of bradycardia, hypotension, yawning, nausea, lightheadedness, narrowing of vision, and ultimately fainting, if escape is precluded (Ost, Sterner, & Lindahl, 1984). Unfortunately, many studies of blood phobia have included only subjects who report faintness, potentially misleading investigators to conclude that fainting is a common, perhaps necessary concomitant of blood phobia. Indeed, the actual prevalence of parasympathetic symptoms and fainting per se among those who report negative affect to and avoidance of blood-related stimuli is unknown.

Overt motor behavior is the third emotional response domain. Like other simple phobias, blood phobics usually physically escape from the bothersome stimulus, thus ending the negative experience. Additionally, blood phobics appear to successfully escape by simply turning their heads or closing their eyes (Beck & Emery, 1985).

Purpose of these Studies

Most of our knowledge of blood phobia stems from the treatment literature, which contains many case studies and several controlled investigations. For example, systematic desensitization (Babcock & Powell, 1982; Cohn, Kron, & Brady, 1976; Elmore, Wildman, & Westefeld, 1980; Kozak & Montgomery, 1981; McGrady & Bernal, 1986; Ost, Lindahl, Sterner, & Jerremalm, 1984; Yule & Fernando, 1980),

implosion (McCutcheon & Adams, 1975; Ollendick & Gruen, 1972) and in vivo exposure treatments with modifications to prevent fainting (Curtis & Thyer, 1983; Ost, Lindahl, Sterner, & Jerremalm, 1984; Ost & Sterner, 1987; Ost, Sterner, & Fellenius, 1989) appear efficacious in treating blood phobia.

Although effective treatments are available, there exists little descriptive information about the basic psychophysiology, psychopathology, and phenomenology of blood phobia. The process of affect change, which is typically complicated in treatment studies, also has received little empirical attention. This dissertation presents two studies which attempt to increase our basic knowledge of blood phobia. Study 1 examined differences between blood phobics and nonphobics in their subjective, physiological, and motoric responses to phobic and neutral material and in several personality characteristics. Study 1 also explored differences in affect to two different blood-related stimuli and examined the effects of stimulus presentation order. Study 2 examined first the change in affect during exposure to phobic material using a habituation-dishabituation paradigm to repeated presentations of a phobic stimulus. Study 2 also investigated the effects of preparing subjects for exposure to the phobic stimulus with audiotaped descriptions, and it examined the influence of imagery ability and coping style on affect across multiple stimulus presentations.

STUDY 1

Introduction

Phobic Subjects and Controls

Researchers typically have recruited blood phobics for study from three sources: patients presenting for treatment of their phobia (e.g., Ost et al., 1989), blood donaters who faint (Graham et al., 1961), and respondents (usually college students) with deviant scores on blood phobia questionnaires (Beiman et al., 1978; Kleinknecht, 1988a, 1988b).

Regardless of recruitment method, only a few studies have compared blood phobics with nonphobic controls. Klorman and colleagues (Klorman et al., 1975, 1977) found that blood phobics (more explicitly, students with elevated scores on the Mutilation Question [MQ], an instrument designed to assess blood-related concerns) responded with cardiac acceleration during 10-second exposures to mutilation slides, whereas normals (low scoring subjects) showed cardiac deceleration. Steptoe and Wardle (1988), used a simple screening questionnaire (not the MQ) and found that blood phobics reported greater anxiety and lightheadedness and had higher heart rates and systolic blood pressures during a surgery film than did nonphobics. The current study also compared blood phobics (those with

elevated MQ scores) with nonphobic controls (low MQ scorers) during exposure to phobic and neutral stimuli and on several personality dimensions in order to enlighten fundamental aspects of blood phobia.

Stimulus Characteristics and Presentation Methods

Research on blood phobics have employed several different stimulus modalities. Some investigators have assessed responding during an in vivo procedure such as venipuncture (Engel & Romano, 1947; Graham, 1961; Kaloupek, Scott, & Khatami, 1985), cardiac catheterization (Glick & Yu, 1963), and pneumoencephalography (Graham, Kabler, & Lunsford, 1961). Unfortunately, this methodology usually lacks rigorous experimental control, exact replications are difficult, and multiple noxious stimuli (e.g., the sight of blood, blood loss, needles, and pain) are present. Other investigators have used movies or films depicting surgical procedures (Steptoe & Wardle, 1988). For example, Ost and colleagues (Ost et al., 1989; Ost, Sterner, & Lindahl, 1984) used a 30-minute continuous, silent videotape showing a series of thoracic surgeries. Slides of mutilations or homicides are the third major stimulus type employed in blood phobia research (Hare, Wood, Britain, & Shadman, 1971; Klorman, Weisberg, & Wiesenfeld, 1977; Klorman, Wiesenfeld, & Austin, 1975). This methodology affords the greatest degree of interpretive clarity, especially because the stimulus remains static. Although a comparison has not been done, films are expected to elicit more powerful exposure

effects than slides because of their increased similarity to in vivo stimuli. Unfortunately, lengthy films such as that of Ost and colleagues lead to differential viewing durations across subjects because of fainting in some subjects. Therefore, the current study used 60 s surgery scenes from Ost's film. These were brief enough that all subjects were expected to be able to watch for the full duration.

The surgical depictions in Ost's film may vary in aversiveness for blood phobics. It is of interest to determine the comparative aversiveness of several different surgical scenes. Therefore, this study compared empirically two of these surgery scenes, to determine if they elicit different degrees of negative affect.

In addition to the above noted utility of studying nonphobic control subjects, it is also important to compare affect to a phobic stimulus with affect to a neutral, nonarousing stimulus. This comparison permits conclusions about the blood-related content of the stimulus as the elicitor of negative affect independent of aspects of the experimental setting involved in simply viewing a stimulus. Steptoe and Wardle (1988) conducted such a comparison and confirmed that blood phobics responded with less negative affect to a neutral film than to a surgery film. This is the only study using films for stimuli that has conducted such a comparison, although several studies using slides have found similar results (Hare et al., 1971; Klorman et al., 1977, Klorman et al., 1975).

Steptoe and Wardle (1988), however, did not counterbalance the order of surgery and neutral film presentation, but always presented the surgery film first. They assumed that phobics would show undesired anticipatory anxiety to the neutral film if it were presented prior to the surgery film. Their failure to counterbalance order opens their findings to the alternative hypothesis that habituation or another learning process resulted in less negative affect during the neutral film. Study 1 corrected for this lapse by counterbalancing stimulus order and evaluating the effects of the two orders to determine the validity of Steptoe and Wardle's findings.

Finally, auditory stimulus presentation is another modality which has been employed in studies of emotion and other anxiety disorders but not in the study of blood phobia. Thus, Study 1 presented to both blood phobics and controls either surgical or neutral audiotaped descriptions of the stimulus film that they had seen earlier. Thus, the group and stimulus content comparisons which were made for the visual material were repeated for auditory material.

Personality Dimensions

In addition to affective differences between blood phobics and nonphobics during surgical and neutral stimuli, it is also of interest to study personality characteristics of blood phobics. Study 1 examined four personality dimensions, derived from anecdotal observations and theories of blood phobia.

Blood phobia's etiology has received some theoretical and empirical attention. Retrospective interviews conducted by behavioral researchers have suggested classical and/or vicarious conditioning etiologies similar to those found for other simple phobias (Ost & Hugdahl, 1985), perhaps facilitated by a genetically-based "preparedness" (Marks, 1969; Seligman, 1971). Several other hypotheses have focussed on blood phobia's uniqueness. Engel (1978) attempted to explain both the initial anxiety and subsequent syncope. He suggested that blood phobics, like most people, are simultaneously sympathetically and parasympathetically aroused by an unnatural sight such as a wound. Sympathetic sensations consistent with the "fight or flight" response fluctuate in dominance with feelings of queasiness and hypotension of the parasympathetic branch. The blood phobic is highly sensitive to his/her arousal, discomfort, and lightheadedness, but strongly wishes to appear in control and attempts to remain socially stoic. Thus, the phobic feels helpless, unable either to fight or flee. The stifled sympathetic branch is deactivated, leaving the remaining parasympathetic activity unfettered, and syncope results. One testable hypothesis from this theory is that blood phobics are more sensitive to their own physical arousal than are nonphobics. Kleinknecht (1988a) found that subjects who reported a history of having nearly or completely fainted had higher "anxiety sensitivity" (Reiss, Peterson, Gursky, & McNally, 1986) than nonfainters; that

is, they were inordinately aware of, focussed on, and concerned about their physical reactions when aroused. Study 1 attempted to replicate this finding and extend it to blood phobics defined somewhat differently than those studied by Kleinknecht.

Anecdotal observations suggest that blood phobics have highly vivid visual images in response to verbal descriptions of blood stimuli. Furthermore, blood phobics frequently report that they "feel" in their own bodies the injury or invasive procedure observed on another. Beck and Emery (1985) noted that such identification with the pain or distress of the victim induces great anxiety in blood phobics, who experience the injury as their own. These observations suggest that blood phobics may have greater visual imagery abilities and a greater capacity for empathy. Imagery ability of blood phobics has not been studied yet, but Kleinknecht (1988a) administered a multidimensional scale of empathy, and found that self-reported fainters had greater feelings of personal discomfort in emotional interpersonal situations than nonfainters. No differences were found on other empathy dimensions such as fantasy, perspective-taking, and general concern. Both imagery ability and empathy were examined in this study.

Finally, a broader question is how similar blood phobia is to other anxiety disorders or to what degree blood phobics experience various dimensions of anxiety in their daily life. For example, are blood phobics' muscle tension,

autonomic arousal, and feelings of fear and insecurity greater than those of nonphobics? Or are these dimensions no different from controls, suggesting dissimilarity to other anxiety and stress-related disorders?

Summary of the Purpose of the Study

Study 1 attempted to increase the rigor of blood phobia studies by including nonphobics controls and a neutral stimulus and by counterbalancing the order of stimulus presentation. Thus, affective differences of blood phobics and nonphobics to surgical and neutral stimuli were examined. Within this paradigm, the effects of stimulus order were evaluated, as were the differences between two surgery scenes. Additionally, audiotaped descriptions of the surgeries were presented to determine whether the auditory modality reliably induces affect differences across experimental groups and stimuli. This study also examined differences between blood phobics and nonphobic controls on several personality dimensions of theoretical importance: anxiety sensitivity, manifest anxiety, mental imagery, and empathy.

Method

Overview

Forty-eight (48) volunteer undergraduate students, half of whom were blood phobic and half of whom were nonphobic, completed questionnaires on mental imagery, empathy, anxiety sensitivity, and manifest anxiety. Subjects then viewed two 60-second video stimuli in counterbalanced order, including

one of two bloody surgeries and a neutral scene. Subjective ratings, physiological responses, and facial expressions of disgust and eye avoidance served as dependent measures. Subsequently, half of the phobics and half of the nonphobics heard an audiotaped description of the surgery, whereas the remaining subjects heard a description of the neutral videotape. Physiological and subjective measures were assessed during the audiotapes.

Subjects

Subjects were 48, 17 to 25-year-old (*M* = 18.9) volunteer University of Florida undergraduates currently enrolled in General Psychology. The final sample was secured after screening 450 potential subjects with the Mutilation Questionnaire (MQ) at the beginning of the semester. Scores from the MQ were arranged in ascending order separately for each gender. Blood phobics (*n* = 24) were defined as the highest scoring 12 males and 12 females (maximum MQ score = 30), which represented the top 6% of each gender distribution. Scores ranged from 15 to 23 (*M* = 18.2) for phobic males and from 23 to 28 (*M* = 25.3) for phobic females. Nonphobics (*n* = 24) were defined as subjects scoring below the median of each gender distribution. The lower half of the distribution was divided equally into twelfths (in order to sample the full range of nonphobics scoring below the median), and one subject was selected from each twelfth, yielding 12 nonphobic males and 12 nonphobic females. Mutilation

Questionnaire scores ranged from 0 to 7 (_M_ = 4.1) for nonphobic males and from 1 to 10 (_M_ = 5.6) for nonphobic females. Selected subjects were contacted via telephone and asked to participate if they were fluent in English and not pregnant. They were told that the study involved "watching several short television presentations and hearing several headphone descriptions while your physical responses are recorded." Four subjects (including one blood phobic) declined to participate due to lack of interest and were replaced. Subjects were paid five dollars for participating.

<u>Procedure</u>

The study took place during a 1 h session; subjects were studied individually.

<u>Psychometric assessment</u>. After subjects read and signed the informed consent form (see Appendix A), they completed two randomly selected questionnaires from the pool of four questionnaires completed during the session (see below). Subjects then were seated in the experimental room for physiological attachments and instructions.

<u>Instructions</u>. Upon entering the experimental room, the experimenter attached to the subject an automated blood pressure (BP) cuff and electrodes to assess heart rate (HR) and skin conductance level (SCL). Attachments were modified until acceptable signal quality was achieved. The BP cuff was inflated several times prior to data collection to accommodate the subject to its functioning. The

experimenter then read to the subject the instructions and protocol which are presented in full in Appendix B. Briefly, subjects were informed that they would be presented a few short videotapes which would depict surgical and/or neutral scenes. Following each presentation, they would rate their emotions experienced during the presentation and then complete a questionnaire. After several video presentations, audiotape presentations would occur according to the same format.

Next, the experimenter taught subjects in the use of the Self Assessment Manikin (SAM), the computerized affect self-report system (Appendix C). After answering subjects' questions, the experimenter exited to the adjacent control room, where he ascertained subjects' group status (phobic or nonphobic), and then randomly determined the order of stimulus presentation and which of the two surgical stimuli were to be used.

Experimental paradigm. Table 1 presents the experimental design and trial sequence of the study, and Table 2 presents the timing durations and measurements for each trial. Baseline subjective ratings were obtained prior to the presentation of the first stimulus; subjects rated their emotions experienced while waiting for the first videotape presentation. After this baseline rating, the paradigm of three trials began.

Each of the three trials followed the same data collection format. The trial began with a baseline BP

assessment. After the cuff deflated, baseline HR and SCL were recorded for the next 30 s, immediately prior to stimulus onset. Contiguous with the end of this 30 s period, the experimenter presented the stimulus to the subject, and HR and SCL continued to be recorded during the 60 s presentation. Immediately at stimulus offset, BP was sampled again, and the affective ratings screen illuminated for subjects to rate the affect they experienced during the videotape. They then waited for the next trial.

For Trials 1 and 2, one of the two surgical videotapes (randomly selected) and the neutral videotape were presented, counterbalancing the order of presentation both for group and gender. For these two trials, the experimenter presented the visual stimulus on the subject's television, and the subject's face was videotaped during the presentation for later analysis of avoidance behavior and facial expression. Following the subjective ratings for Trials 1 and 2, the experimenter reentered the experimental chamber and gave subjects the third (after Trial 2) and the fourth (after Trial 3) personality questionnaires; completion time of each averaged about five minutes. Following Trial 2 and the fourth questionnaire completion, the experimenter placed headphones on the subject for Trial 3 (the final trial), which was a single audiotape presentation. The experimenter randomly selected either the surgical audiotape (describing the surgical videotape the subject had viewed) or the neutral audiotape (describing the

Table 1. Experimental Procedure and Trial Sequence for Study 1

	TRIAL 1		TRIAL 2		TRIAL 3
QUESTIONNAIRES # 1 & 2	Surgery or Neutral VIDEOTAPE	QUESTIONNAIRE # 3	Neutral or Surgery VIDEOTAPE	QUESTIONNAIRE # 4	Surgery or Neutral AUDIOTAPE

Table 2. Timing Durations and Measures for Each Trial

		ONSET	Stimulus presented	OFFSET	
BP base	HR, SCL base		HR, SCL, (Face:Trials 1,2)		BP, SAM
about 30 s	30 s		60 s		about 30 s

neutral videotape the subject had viewed). The selection of the surgical or neutral audiotape was balanced across phobia group, gender, and the order of videotape stimulus presentation (surgical stimulus first or neutral stimulus first) during Trials 1 and 2. Trial 3 followed the timing and data recording paradigm of the first two trials, except that subjects' faces were not videotaped. After Trial 3, the experimenter disconnected the recording devices, debriefed subjects in accordance with APA guidelines (Appendix D), and dismissed them.

Stimuli

Both phobic (surgical) and neutral videotape and audiotape stimuli were used in this study; all stimuli were 60 s in duration. Three different videotapes were used, including two surgical tapes and one neutral tape; all videotapes were silent. The two surgical videotapes were taken from the 30-minute film of thoracic operations used by Ost and colleagues in their studies of blood phobia (e.g., Ost & Sterner, 1987). The two 60 s segments used in this study depicted particularly aversive procedures in which some cutting or piercing with a sharp instrument occurs. "Incision" showed a scalpel incising the abdomen several times, and other sharp instruments cutting muscle tissue. The second surgical stimulus, "Tubes," showed a sharp tool puncturing two holes in the abdomen and then plastic drainage tubes being pulled through the holes. Neither surgical scene revealed the patient's head or genitalia.

The single neutral videotape showed a wooden toy truck being pushed over several white ramps and a person's hand picking up and later putting down yellow blocks.

Three audiotape stimuli (two surgical and one neutral) were employed, one corresponding to each of the three video stimuli noted above. Each audiotape presented the voice of a female who narrated the events in the respective videotape in an informative, affectively neutral manner. Each description was 60 s and 160 words long. (See Appendix E for the transcripts of these descriptions and others used in Study 2.)

Experimental Environment and Apparatus

Subjects were seated in a recliner with their legs parallel to the floor, and torso reclined at approximately 30 degrees from vertical, in a 4 m X 4 m experimental chamber. The chamber's overhead lights were off, but the room was dimly lit by a floor lamp. A 66 cm (26 in) RCA Lyceum color television was positioned 2 m in front of the subject's face. This television presented the videotape stimuli which were recorded on half-inch VHS videotapes and played from a Panasonic videorecorder in the adjacent control room. A 25.4 cm (10 in) Apple computer video monitor positioned immediately to the right of the subjects' television presented the self-report ratings display. Subjects controlled the display by manipulating a potentiometer knob on a control box attached to the right arm of their chair. A black and white Panasonic videocamera

with a zoom lens was mounted on the wall in the experimental chamber near the ceiling slightly to the left of the television. The camera was focussed on the subject's face, permitting accurate assessment of the direction of gaze, eye closings, and tensing of facial muscles. Videorecordings of the subject were made on half-inch VHS videotapes in a second Panasonic videorecorder in the control room. During Trial 3, subjects wore comfortable Realistic NOVA 40 stereo headphones, through which they heard the audio stimuli, which were recorded on audiocassette tapes and played to subjects from a General Electric stereo cassette player.

The control room was further equipped with an IBM-PC AT which ran VPM software (Cook, Atkinson, & Lang, 1987) to control physiological data collection and the presentation of the affect ratings display. (See Appendix F for the VPM control program for this study.) VPM also controlled physiological data sampling, recording, and analysis using a Scientific Solutions Labmaster board, an Axon Instruments TL-1 interface panel, and Coulbourne modules. The control room also housed a Roche Ultrasonic Blood Pressure Monitor, Arteriosonde 1225.

Questionnaires

Five questionnaires were used in this study.

1) Mutilation Questionnaire (MQ; Klorman, Weerts, Hastings, Melamed, & Lang, 1974). The MQ is a 30-item, true-false questionnaire designed to assess an individual's fear of, discomfort with, or aversion to blood, injury, mutilation,

and related stimuli. The questionnaire's authors provided normative data for male and female college students. Several studies have shown the validity of the MQ relative to psychophysiological and behavioral indices of blood-injury concerns (Beiman et al., 1978; Green, Webster, Beiman, Rosmarin, & Holliday, 1981; Klorman et al., 1977; Ost, Lindahl, Sterner, & Jerremalm, 1984; Ost & Sterner, 1987).

2) Questionnaire Upon Mental Imagery (QMI; Sheehan 1967). This questionnaire is the shortened version of Betts' (1909) original instrument. The QMI contains 35 stimulus items categorized in seven major sensory modalities. Subjects are asked to rate the vividness of the images that come to mind for each item using a seven point scale ranging from 1 ("Perfectly clear and vivid") to 7 ("No image at all"). The sum of all ratings is the total score, which ranges from 35 - 245, with low scores indicating better imagery ability. This questionnaire has been normed (White, Ashton, & Brown, 1977) and has demonstrated reliability (Evans & Kamemoto, 1973; Hiscock, 1978) and validity (Cook, Melamed, Cuthbert, McNeil, & Lang, 1988; Miller et al., 1987; Hiscock, 1978).

3) Interpersonal Reactivity Index (IRI; Davis, 1980). The IRI is a 28-item, self-report questionnaire consisting of four, factor-derived, 7-item subscales, each of which assesses a specific aspect of empathy. The Perspective-Taking scale measures the tendency to adopt the point of view of other people in everyday life. The Fantasy scale

measures the tendency to transpose oneself into the feelings and actions of fictitious characters in books, movies, and plays. The Empathic Concern scale measures the tendency to experience feelings of warmth, compassion, and concern for other people. The Personal Distress scale taps one's own emotional feelings of personal unease and discomfort in reaction to the emotions of others. Subjects responded to each item on a 5-point scale ranging from 0 ("does not describe me well") to 4 ("describes me very well"). Ratings are summed for the items in each scale, yielding four scores. Davis (1980) reported that the four scales have adequate internal consistency and test-retest reliability, although females score higher than males on all scales. Convergent and discriminant validity have been reported with other self-report dimensions (Davis, 1983) and affective reactions to video stimuli (Davis, Hull, Young, & Warren, 1987).

4) Anxiety Sensitivity Index (ASI, Reiss et al., 1986). The ASI is a 12-item questionnaire that measures individual differences in hypersensitivity to one's own anxiety responses and behavior. Respondents endorse each item using a 5-point scale ranging from "Very little" (0) to "Very much" (4). A person's score on the ASI is the sum of the scores on the 16 items. Reiss et al. (1986) provided reliability data showing that the ASI has adequate internal consistency and test-retest reliability. They also found that anxiety disorder patients scored higher than non-

disordered subjects, and the questionnaire accounted for Fear Survey Schedule variance which remained unaccounted for by specific fear endorsement.

5) Fenz and Epstein Anxiety Questionnaire (FEQ; Fenz & Epstein, 1965; Fenz, 1967). The FEQ is a 53-item questionnaire listing symptoms of anxiety which are rated by the respondent on a 5-point scale ranging from 1 ("never applies to you") to 5 ("experience it almost all of the time"). The scale was developed and factor analyzed to divide manifest anxiety into its component dimensions. Three factors are separately scored by totaling the ratings for the items in each scale: striated muscle tension, autonomic arousal, and feelings of fear and insecurity. Fenz (1967) provided reliability coefficients for each scale and found that "neurotics" scored higher than normals on all three scales.

Dependent Measures

Dependent measures are categorized according to Lang's (1968) three systems model of emotion: self-report indices (i.e., verbal behavior or subjective responses), physiological reactions, and overt motor behavior.

Self-report.[1] The Self Assessment Manikin (SAM; Hodes, Cook, & Lang, 1985; Lang, 1980) is a graphic video display instrument for obtaining subjective ratings on three independent affective dimensions: pleasure--displeasure, arousal-calmness, and control--lack of control. SAM is presented as a manikin whose features are dynamically

modifiable by subjects to represent their affect using a potentiometer on the arm of their chair. The VPM software program presents the three graphic displays in random order to the subject on a video monitor. The pictorial display is converted by the computer to a 21-point scale. In the pleasure display, SAM's facial expression changes from a smile to a frown; in the arousal display, SAM's "abdomen" (a random and changing patters of dots) increases or decreases in size and rate of change, and SAM's eyes open and close; in the control display, SAM changes in size from very small to very large. The validity of the three SAM ratings of affect has been demonstrated in several studies (Cook et al., 1988; Greenwald, Cook, & Lang, in press; Hodes et al., 1985). For these three self-report measures, difference scores were calculated by subtracting the baseline affect rating (taken before Trial 1) from the affect rating for each trial. These studies used labels for the negative poles of each affective dimension ("displeasure," "arousal," "lack of control") to achieve consistency in presentation.

Physiological indices. Three different physiological indices of affect were assessed.

1) Skin conductance level (SCL). SCL was recorded from two Beckman Ag-AgCl miniature electrodes placed on the thenar and hypothenar eminence of the left hand after moistening the palm with distilled water. A neutral paste (petroleum jelly) was used in the electrode. Analog SCL was sampled at 10 hertz using a .5 volt constant voltage Coulbourne Skin

Conductance Coupler (S71-22), which output a digital signal to the computer. VPM software reconverted the digital value to micromhos, and calculated mean SCL for the 10 s baseline immediately prior to stimulus onset and for the entire 60 s stimulus presentation period. SCL difference scores were calculated by subtracting the 10 s baseline SCL from the stimulus SCL.

2) Heart rate (HR). The electrocardiogram (ECG) was recorded from two Beckman Ag-AgCl miniature electrodes placed on the left and right forearms after preparing the subject's skin with alcohol and electrode paste (Hewlett-Packard Redux). The ECG waveform was sampled at 10 hertz and fed from a Coulbourne bioamplifier (S75-01) into a Coulbourne Bipolar Comparator (S21-06), which detected the "R" wave at suprathreshold levels, and output the signal into a Coulbourne Retriggerable One Shot (S52-12), which then output a digital signal to the computer. VPM software calculated R-R interbeat intervals to the nearest millisecond and converted heart period to heart rate. Mean HR was calculated for 10 s baseline immediately prior to stimulus onset and for the 60 s stimulus presentation period. HR difference scores were calculated by subtracting the baseline HR from the stimulus HR.

3) Blood pressure. Both systolic blood pressure (SBP) and diastolic blood pressure (DBP) were monitored using an automated sphymomanometer with the cuff attached to subjects' left upper arm. The experimenter manually

initiated cuff inflation from the control room and then recorded the LED digital output by hand. Cuff inflation required about 5 s, and deflation required about 25 s. Difference scores were calculated by subtracting the SBP and DBP values taken before each trial from the values obtained at stimulus offset.

Motor behavior. Two variables were assessed from the videotaped recordings of subjects' faces while they watched the surgery and neutral videotapes. Two independent raters, blind to the study hypotheses and to the videotape type (surgery versus neutral) for each subject were trained to code these variables.

1) Avoidance of eye contact with stimulus. This measure was recorded as the number of seconds out of 60 that a subject's eyes were closed or were not directed at the television screen during the stimulus. Because the resulting distribution was highly skewed and, therefore, not amenable to parametric statistics, subjects were dichotomously classified for each videotape. Avoidance was coded positively if subjects showed at least one second of avoidance during the videotape, and negatively if there was less than one second of avoidance. Interrater reliability was calculated as the percentage agreement between the two coders. They agreed on the presence or absence of avoidance for 47 of 48 subjects (98%) during the surgery videotape, and they agreed on all 48 subjects (100%) for the neutral videotape.

2) Facial expressions of disgust. An evaluation of all videotapes indicated that when subjects made a facial expression during viewing, they routinely tensed either or both of two muscle groups, resulting in furrowing of the eyebrows and raising of the upper lip. According to Ekman, Friesen, and Ellsworth (1972), this facial pattern signifies the emotion of disgust. Thus, coders rated the maximum degree that these muscle groups were tensed during each 60 s videorecording using a 5-point scale (0 = "no tensing evident," 1 = "minimal tensing," 2 = "mild tensing," 3 = "moderate tensing," 4 = "severe tensing"). Since the distribution of ratings for the nonphobics was restricted greatly, and the vast majority of ratings for both groups was zero during the neutral videotape, the data were treated as frequency data and collapsed into three categories to increase the n per cell. Original values of 0 were classified as "none," values of 1 and 2 were classified as "low," and values of 3 and 4 were classified as "high." The two raters agreed on the scoring for the three levels of facial disgust for 46 of 48 subjects (96%) during the surgery stimulus, and 45 of 48 subjects (94%) during the neutral stimulus.

Results

Personality Measures

The means and standard deviations for each of the four personality questionnaires and their subscales for the phobics and nonphobics are presented in Table 3. Phobics

were compared with nonphobics using independent groups _t_-tests. As Table 3 indicates, phobics had greater anxiety sensitivity (ASI), feelings of personal distress (IRI-Personal Distress), and general fear and insecurity (FEQ) than did the controls. The groups did not differ on the IRI subscales of Fantasy, Empathic Concern, or Perspective Taking Ability, nor on the FEQ subscales of Muscular Tension or Autonomic Arousal. Unexpectedly, the nonphobics reported better mental imagery ability (QMI) than did the phobics.

Videotape Stimuli

Data analysis. A general data analytic strategy examined affect during the two videotape stimuli (Trials 1 and 2) for displeasure, arousal, lack of control, HR, SCL, SBP, and DBP. First, each dependent measure was analyzed in a mixed-model repeated-measures analysis of variance (ANOVA) in which Video (surgery and neutral videotape) was the within-subject effect, and Group, Order (surgery videotape presented first or neutral videotape presented first), and Surgery ("Incision" or "Tubes" videotape) were between-subjects variables. Significant interactions from this model were examined via simple effects analyses using appropriate error terms for repeated-measures models (Howell, 1982) and corrected error degrees of freedom when heterogeneous sources of error variance were pooled (Satterthwaite, 1946). Typically, these simple effects analyses examined differences between phobics and controls for each videotape separately, and each Group was examined

Table 3. Questionnaires Scores for Phobics and Nonphobics

Measure	Phobics M	Phobics (SD)	Nonphobics M	Nonphobics (SD)	t(46)	p
ASI	24.1	(8.2)	15.9	(10.4)	3.04	.004
IRI						
Personal Distress	14.9	(5.0)	8.8	(3.4)	4.87	.0001
Fantasy	17.6	(5.2)	18.7	(5.6)	0.70	n.s.
Empathic Concern	21.0	(3.3)	20.4	(4.9)	0.52	n.s.
Perspective taking	16.0	(5.9)	18.5	(4.9)	1.63	.11
FEQ						
Fear/Insecurity	49.8	(10.9)	40.3	(11.6)	2.91	.006
Muscular Tension	31.0	(7.9)	30.9	(10.8)	0.04	n.s.
Autonomic Arousal	30.8	(7.6)	28.4	(10.0)	0.93	n.s.
QMI	92.0	(24.1)	74.3	(14.3)	3.12	.003

[a] p-values were determined using two-tailed tests

separately across the two videotapes. Simple effects analyses were considered significant at the .01 probability level. Appendix L presents the complete ANOVA tables.

Self-report measures. Displeasure, arousal, and lack of control change scores from baseline for the phobics and nonphobics for both surgery and neutral videotapes are presented in Table 4. Similar results were found for all three measures. During the surgery videotape, phobics reported more arousal, displeasure, and lack of control than did the nonphobics, whereas during the neutral videotape, the two groups did not differ in any measure. Across videotapes, the phobics reported greater negative affect on all three measures to the surgery than to the neutral videotape. The nonphobics reported greater arousal to the surgery than to the neutral videotape, but no difference in control to the two videotapes, (Video X Group interactions for displeasure, $F(1, 40) = 34.91$, $p < .0001$; arousal, $F(1, 40) = 14.76$, $p < .0004$; and lack of control, $F(1, 40) = 24.33$, $p < .0001$). For displeasure, however, there was an influence of videotape order (see Appendix K for these data). Phobics reported more displeasure to the surgery videotape when it was presented before, but not after, the neutral videotape. Nonphobics reported more displeasure to the surgery videotape than to the neutral videotape only when the surgery was presented after, but not before, the neutral videotape, (displeasure Video X Group X Order interaction, $F(1, 40) = 8.73$, $p < .006$). Videotape order

Table 4. Self-Reported Changes in Displeasure, Arousal, and Lack of Control During the Surgery and Neutral Videotapes for Phobics and Nonphobics

	Videotape Stimulus			
	Surgery		Neutral	
	M	(*SD*)	*M*	(*SD*)
Phobics				
Displeasure	9.7	(4.6)	-0.7	(2.6)
Arousal	8.1	(6.9)	-4.0	(6.7)
Lack of Control	4.7	(6.3)	-5.4	(4.4)
Nonphobics				
Displeasure	2.8	(3.8)	-0.3	(3.2)
Arousal	2.8	(5.7)	-3.6	(4.2)
Lack of Control	-1.9	(5.0)	-4.1	(4.5)

did not affect arousal or control, and surgery type ("Tubes" or "Incision") was unrelated to any self-report variable.

Physiological measures. Figure 1 presents mean SCL and HR change scores during the "Incision" and "Tubes" surgery videotapes and the neutral videotape for phobics and nonphobics. As the figure reveals, the SCL and HR of the phobics who viewed "Incision" was greater than the SCL and HR of a) nonphobics who viewed "Incision," and b) phobics who viewed "Tubes." Phobics and nonphobics did not differ in SCL or HR during "Tubes," nor did the nonphobics' SCL or HR differ to the two surgeries. Across videotapes, both phobics and nonphobics had a greater SCL during the surgery than the neutral videotape, regardless of Surgery type. However, HR change was greater during the surgery than the neutral videotape only for phobics who viewed "Incision," but not for phobics who viewed "Tubes" or for the nonphobics. Phobics and nonphobics did not differ in SCL or HR during the neutral videotape, (for SCL: Group X Surgery, $F(1, 40) = 4.30$, $p = .044$, and Video X Group X Surgery, $F(1, 40) = 3.74$, $p = .06$; for HR: Video X Group X Surgery, $F(1, 40) = 12.07$, $p = .001$).

Although videotape Order failed to significantly affect SCL, it did influence HR (see Appendix K). Phobics who viewed a surgery before viewing the neutral videotape had a greater HR increase than a) nonphobics who saw a surgery first, and b) phobics who saw a surgery second. Across videotapes, only those phobics who saw a surgery before the

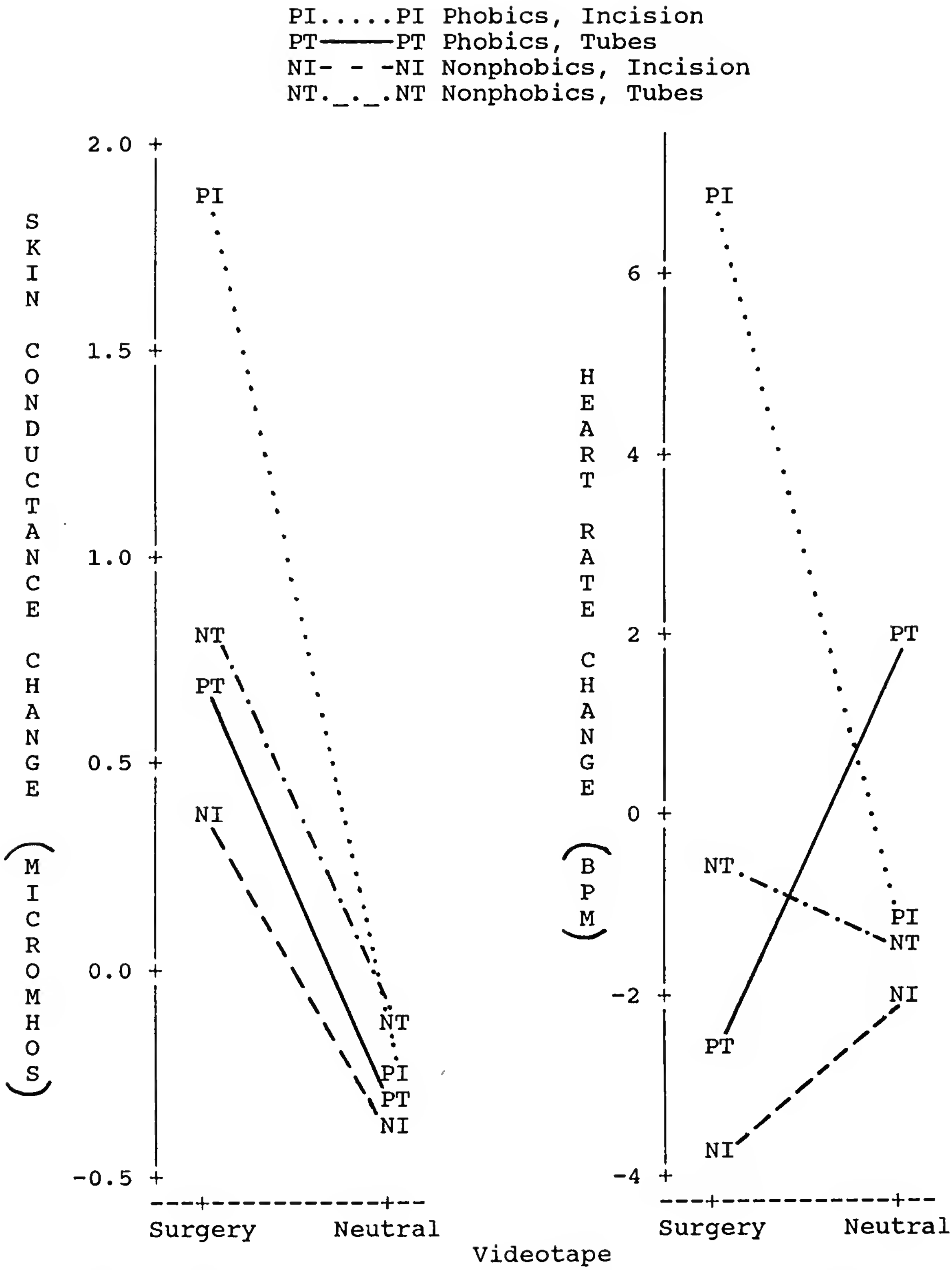

Figure 1. Skin Conductance Level Change and Heart Rate Change Across Surgery and Neutral Videotapes for Phobics and Nonphobics by Type of Surgery Viewed

neutral videotape had a greater HR during the surgery than during the neutral, (Video X Order, $F(1, 40) = 12.79$, $p = .0009$; Group X Order, $F(1, 40) = 4.16$, $p = .048$).

Analyses of changes in SBP and DBP failed to reveal any significant effects or even nonsignificant trends within or across videotapes or as a function of Group, Order, or Surgery for either dependent measure.

Motor behavior measures. Avoidance and the maximum facial expression of disgust during the videotapes were analyzed as frequency data using chi-square analyses. Tables 5 and 6 present these data for both phobics and nonphobics for both videotapes by type of surgery and order of presentation. Phobics more frequently avoided and showed "high" disgust[2] than did the nonphobics during the surgery "Incision" but not during "Tubes," (avoidance, $X^2(1) = 8.71$, $p < .005$; disgust, $X^2(1) = 9.88$, $p < .005$). Among the phobics, avoidance was significantly more frequent, and "high" disgust tended to be more frequent during "Incision" than during "Tubes," (avoidance, $X^2(1) = 6.171$, $p < .013$; and disgust, $X^2(1) = 2.74$, $p < .10$). Avoidance and disgust of the nonphobics was not influenced by the type of surgery. With respect to stimulus order, phobics avoided the surgery videotape more than the nonphobics only when the surgery was shown first, $X^2(1) = 5.04$, $p < .025$; but the groups did not differ in avoidance of the surgery when it was presented after the neutral videotape. Stimulus order did not affect the phobics or nonphobics' avoidance of the surgery when

Table 5. Number of Phobics and Nonphobics Displaying Avoidance Behavior During the Surgery and Neutral Videotapes by Type of Surgery Viewed and Order of Videotape Presentation

	Videotape Stimulus			
	Surgery		Neutral	
	Avoidance			
	Yes	No	Yes	No
Phobics (n=24)	10	14	4	20
Type of Surgery				
"Incision" (n=12)	8	4	4	8
"Tubes" (n=12)	2	10	0	12
Order of Presentation				
Surgery first (n=12)	6	6	3	9
Neutral first (n=12)	4	8	1	11
Nonphobics (n=24)	2	22	2	22
Type of Surgery				
"Incision" (n=12)	1	11	0	12
"Tubes" (n=12)	1	11	2	10
Order of Presentation				
Surgery first (n=12)	1	11	1	11
Neutral first (n=12)	1	11	1	11

Table 6. Number of Phobics and Nonphobics Displaying Facial Expressions of Disgust During the Surgery and Neutral Videotapes by Type of Surgery Viewed and Order of Videotape Presentation

	Videotape Stimulus					
	Surgery			Neutral		
	Disgust Level					
	none	low	high	none	low	high
Phobics (n=24)	5	9	10	22	2	0
Type of Surgery						
"Incision" (n=12)	1	4	7	10	2	0
"Tubes" (n=12)	4	5	3	12	0	0
Order of Presentation						
Surgery first (n=12)	2	4	6	12	0	0
Neutral first (n=12)	3	5	4	10	2	0
Nonphobics (n=24)	8	16	0	21	3	0
Type of Surgery						
"Incision" (n=12)	4	8	0	10	2	0
"Tubes" (n=12)	4	8	0	11	1	0
Order of Presentation						
Surgery first (n=12)	5	7	0	10	2	0
Neutral first (n=12)	3	9	0	11	1	0

each group was examined alone. The disgust of both groups was not affected by the order of presentation. Finally, during the neutral videotape, phobics did not differ from nonphobics in avoidance or disgust.

Next, the frequency of avoidance and disgust across the two videotapes was examined.[3] Significantly more phobics (7 of 8) differentially avoided the surgery rather than the neutral videotape, $\underline{X}^2(1) = 4.50$, $\underline{p} < .035$; and more phobics (19 of 19) showed higher levels of disgust during the surgery videotape than during the neutral videotape, $\underline{X}^2(1) = 19.0$, $\underline{p} < .0001$. The nonphobics did not differentially avoid the two stimuli, but all 13 of the nonphobics who differentially showed disgust to the two videotapes showed higher disgust levels during the surgery videotape, $\underline{X}^2(1) = 13.0$, $\underline{p} < .001$. Surgery type and presentation order did not influence disgust across videotapes.[4]

Audiotape Stimuli

Data analyses. Dependent measures assessed during the audiotape presentation (Trial 3) included displeasure, arousal, lack of control, HR, SCL, SBP, and DBP. Motor behavior was not assessed during the audiotape trial. Data analyses for these dependent measures used univariate ANOVAs which included the following between-subjects effects and their interactions: Audio (whether the subject heard the surgery or the neutral audiotape), Group, Order (of the preceding surgery and neutral videotapes), and Surgery.

Self-report measures. Data for the three self-report measures for phobics and nonphobics by type of audiotape presentation (surgery or neutral) are presented in Table 7. The results for displeasure and control lack are identical. Phobics who heard a surgery audiotape reported more displeasure and lack of control than nonphobics who heard a surgery audiotape, and more displeasure and lack of control than phobics who heard the neutral audiotape. These two variables did not differ for the nonphobics during the two audiotapes. The two groups did not differ in displeasure or lack of control during the neutral audiotape, (Group X Audio interactions for displeasure, $F(1, 32) = 7.95$, $p < .009$; and lack of control, $F(1, 32) = 10.57$, $p < .003$). For arousal, whether subjects were phobic or not, greater arousal was reported to the surgery audiotape than to the neutral audiotape, (Audio main effect, $F(1, 32) = 27.03$, $p < .0001$). For all three self-report measures, there was no difference in response to "Incision" or "Tubes" or to the order in which the subjects had viewed the preceding videotapes.

Physiological measures. Subjects who heard the surgery audiotape had a higher SCL ($M = -0.21$, $SD = 0.56$) than subjects who heard the neutral audiotape ($M = -0.51$, $SD = 0.36$), Audio main effect, $F(1, 32) = 5.08$, $p < .032$. There were no differences between phobics and nonphobics, nor were there differences as a function of Surgery or Order. For HR, SBP, and DBP, the ANOVAs revealed no significant effects of Audiotape, Group, or the other independent variables.

Table 7. Self-reported Change in Displeasure, Arousal, and Lack of Control During the Audiotape Presentation for Phobics and Nonphobics by Type of Audiotape (Surgery or Neutral)

	Audiotape Stimulus			
	Surgery		Neutral	
Phobics	*M*	(*SD*)	*M*	(*SD*)
Displeasure	7.7	(4.7)	0.3	(3.6)
Arousal	4.8	(4.6)	-2.6	(7.3)
Lack of Control	3.1	(4.9)	-6.3	(3.5)
Nonphobics				
Displeasure	2.7	(2.5)	1.9	(2.8)
Arousal	3.2	(4.9)	-5.4	(5.2)
Lack of Control	-1.7	(3.8)	-3.1	(4.3)

Discussion

This study accomplished several goals. First, it compared blood phobics with nonphobic controls on specific personality dimensions and found differences of theoretical importance. Second, affect (subjective, psychophysiologic, and motor) of phobics and nonphobics was examined during surgical and neutral videotapes. Phobics displayed more negative affect to the surgical presentation than did the nonphobics, but the groups did not differ during the neutral stimulus. Both groups had greater negative affect to the surgical than to the neutral stimulus. Third, two different surgery videotapes were compared, and one was more aversive than the other. Fourth, the order of surgical and neutral stimulus presentations was evaluated and found to have some effect on responding. Finally, phobics and nonphobics heard surgical or neutral audiotape presentations, and the observed differences were fairly limited.

Psychometric Assessment

Theory and anecdotal observations specific to blood phobia guided the assessment of four personality dimensions. Consistent with the findings of Kleinknecht (1988a), blood phobics reported greater "anxiety sensitivity," suggesting they are more attuned to and concerned about physiological indices of their own arousal than are nonphobics. Unfortunately, the questionnaire assessed sympathetic aspects of anxiety and not the parasympathetic activity which blood phobics may experience. Nonetheless, if one can

extrapolate from the current assessment of anxiety to parasympathetic symptoms, then this finding supports Engel's (1978) hypothesis that blood phobics are hypervigilant about and overly fearful of their own negative physical and emotional responses to blood-related stimuli. Future research should assess parasympathetic symptoms to test this extrapolation.

The Fenz-Epstein Anxiety Questionnaire assessed the degree to which blood phobics differ from normals and are like other anxiety and psychosomatic disordered patients ("neurotics"). Blood phobics did not have elevated general levels of autonomic arousal or muscular tension, suggesting that they differ from the classic neurotic pattern of anxious tension and autonomic lability. However, like other "neurotic" patients, blood phobics reported greater general fear and insecurity than controls. This finding is consistent with Engel's (1978) model in that blood phobics may overly seek to appear socially adequate and in control, especially when experiencing discomforting physical and emotional sensations.

The suggestion that blood phobics strongly identify with the victim (Beck & Emery, 1986)--that they are able to "feel" what the other person is feeling or to "get under the skin" of the other--was assessed via questionnaires of empathy and mental imagery. On the empathy scale, blood phobics and controls did not differ in their ability to fantasize, to take another's perspective, or in their

concern and caring about others. Yet blood phobics rated themselves as more likely to feel personal distress or unease in reaction to other's negative emotions. This finding replicates that of Kleinknecht (1988a) and helps to operationalize the notion of identifying with a victim. Thus, an injury or pain in another person precipitates quite readily negative affect in the blood phobic.

Mental imagery ability was assessed also to examine identification with the victim. Unexpectedly, nonphobic controls reported more vivid mental imagery than phobics. This may be due not to poor imagery of phobics, but rather to a nonphobic sample with unusually good imagery scores. Replication with another sample is needed to confirm the group difference.

It is tempting to speculate that the increased anxiety sensitivity, general fear and insecurity, and personalized empathic distress predated and abetted the full-blown phobia; however, it is quite possible that these characteristics resulted from one or more negative reactions to blood-relevant stimuli. Longitudinal research is needed to clarify this interpretive bind.

Affect During Videotaped Stimuli

This study used neutral stimulus material to control for the effects of the experimental setting and stimulus viewing and to permit definitive conclusions regarding the affective responding of phobics and nonphobics to phobic material. Thus, all subjects viewed a 60 s neutral

videotape in addition to a 60 s surgical videotape. Equivalent levels of negative affect were displayed by both groups during the neutral videotape, suggesting that any observed differences during the surgical scene were not attributable to extraneous factors of the experimental setting.

Given the affective equivalence of phobics and nonphobics to the neutral stimulus, it was expected that phobics would report greater negative affect, be more physiologically aroused, and show more avoidance and facial expressions of disgust during a surgical videotape than would nonphobics. Indeed, for most dependent measures, the average scores of the blood phobics as a group indicated that they had greater negative affect. Yet, the observed differences for several dependent measures were limited by the particular surgery scene viewed and/or the order of videotape presentation.

For HR, SCL, facial disgust, and avoidance, differences between phobics and controls were limited to the surgery videotape, "Incision," which depicted a scalpel cutting a person's abdomen and sharp tools opening the wound. Phobics who viewed this surgery responded more negatively than did nonphobics who viewed "Incision." No differences were found between phobics and nonphobics during the surgery videotape "Tubes," which showed a pliers-type tool puncturing a person's abdomen and pulling plastic drainage tubes through the holes. The nonphobics responded with a fairly low level

of negative affect to both surgeries; however, among the phobics, "Incision" was more aversive than "Tubes." The observed differences between the two surgical scenes is interesting, in that both scenes show blood and the "mutilation" of a portion of one's abdomen.

There are several possible explanations for the observed differences. First, although the two videotapes were similar in gross aspects, "Incision" simply may be a more powerful aversive stimulus than "Tubes," in that a scalpel cutting may be more aversive than a pair of pliers puncturing and pulling. A second, perhaps related hypothesis pertains to the observers' comprehension of the events depicted. In this study, subjects had been informed previously only that the videotapes showed portions of a surgery on a living human being. The insertion of the tubes might have not been recognized readily as a surgical procedure, in contrast to the clearly recognized scalpel incision. Thus, "Tubes" might have evoked increased curiosity, and hence, less aversion than "Incision." This hypothesis might be empirically examined by providing subjects a description of the "Tubes" surgery before or during viewing, thus eliminating uncertainty about content.

Affective group differences to the surgery videotapes were limited also by the order of videotape presentation. During the surgery presentation, phobics had higher HRs and showed more avoidance than controls only when the surgical stimulus was presented first rather than second; when the

surgery was presented after the neutral, the groups did not differ. Among phobics, a surgical scene viewed first elicited more displeasure as well as tachycardia and avoidance than did a surgical presentation after the neutral videotape.

A parsimonious explanation for the observed effects is that habituation occurred, and subjects felt generally less aroused to a later presentation of a surgery than to an earlier presentation due to the passage of time and accommodation to the experimental setting. An alternative explanation is that subjects acquired information during the earlier presentation of the neutral stimulus which resulted in lower anxiety on a subsequent presentation. Information potentially acquired during the initial neutral exposure included the duration of the stimulus, the functioning of the television, and a reduction in ambiguity regarding which stimulus (surgery or neutral) they were most likely to see next. A test of these two hypotheses might be achieved by comparing two groups of phobics, one which views a neutral followed by a surgery film, whereas the other waits an equal length of time before viewing a surgery film. Alternatively, order effects might be controlled by providing a practice videotape trial before presenting the two stimuli of interest and informing subjects of the order of scenes.

Thus, several variables other than the presence or absence of blood phobia influenced responding to surgical

stimuli. It should be remembered, however, that the observed effects of surgery type and/or order may be due to bias in random assignment; for example, the 12 phobics assigned to view "Incision" or to view a surgery before the neutral videotape may have differed in some important, yet unassessed way from other phobics. The need for replication on a different and larger sample of phobics is clear.

In addition to comparisons between phobics and nonphobics, this study examined each group's affect to both surgical and neutral stimuli. As expected, phobics reported greater displeasure, lack of control, and arousal during the surgery videotape than during the neutral videotape. Nonphobics also reported greater arousal to the surgery stimulus, but limited or absent differences in displeasure and control. On physiological measures, the differences between videotapes were less robust. Both phobics and nonphobics had a higher SCL during the surgery videotape in comparison to the neutral videotape. For HR, only those phobics who viewed "Incision" or who viewed a surgery first were more tachycardic during the surgery than during the neutral videotape. The HR of other phobic subgroups and of the nonphobics did not differ during the two stimuli. Blood pressure measures did not differentiate the two videotapes for either group. Finally, both phobics and nonphobics more frequently displayed facial expressions of disgust to the surgery than to the neutral videotape; however, only the phobics more frequently avoided the surgery than the neutral

videotape. In summary, phobics clearly showed more negative affect during the surgery videotape than during the neutral videotape, especially for the surgery "Incision," whereas nonphobics showed similar but less pronounced and less consistent affective differences to the two stimuli. The observation of some increase in negative affect to the surgery scene for the nonphobics is consistent with the view that aversiveness to blood-related stimuli exists on a continuum. Whereas extreme cases may be considered phobic, cases selected from other portions of the distribution (such as below the median) have relatively less aversion, but still more than to a neutral stimulus.

Steptoe and Wardle (1988) suspected that when both blood-related and neutral material were presented to blood phobics, the order of presentation would be important. In their study, they eschewed stimulus counterbalancing and presented to all subjects the bloody stimulus first followed by the neutral stimulus. They presumed that the presentation of the neutral stimulus first to half of the phobics would have yielded a biased sample of "neutral" responding, with elevated fear due to anticipatory anxiety over the upcoming phobic stimulus. The current study tested their assumption and found, contrary to their hypothesis, no evidence that responses during a first presentation of the neutral videotape differed from responses during the second neutral stimulus presentation. Furthermore, the order effects found in this study suggest that Steptoe and

Wardle's presentation of the blood stimulus first probably resulted in greater negative affect to it, and greater differences between the blood and subsequent neutral stimulus.

Affect During Audiotaped Stimuli

This study also assessed affective responding during verbal descriptions of phobic and neutral stimuli in order to understand how various stimulus presentation modalities influence the affect of blood phobics. All subjects heard an audiotaped description of either the surgery or the neutral scene that they had just seen.

Phobics who listened to a surgical description reported more displeasure and control lack than phobics who heard the neutral description or nonphobics who heard a surgical description; however, only these two variables discriminated conditions. Self-reported arousal and SCL were increased during the surgery audiotape regardless of whether a person was phobic or not, and neither HR nor BP measures differed as a function of stimulus content or group. In summary, the effects of group and stimulus type during audiotape presentations were less robust than during videotape presentations. Potential reasons are discussed later.

Methodological Issues

It must be acknowledged that the observed differences between phobics and nonphobics and also between surgical and neutral stimuli were of limited magnitude. First, the subject selection procedure probably reduced group

differences. Phobics and nonphobics were selected from different points of a nearly normal distribution of MQ scores using rather arbitrary cut-scores. Restriction of those ranges by studying only the few highest scoring phobics or lowest scoring nonphobics might have increased the observed effect size. Alternatively, studying phobics presenting for treatment (although such people are rare) likely would have yielded more clear differences.

Limited differences also were found between surgical and neutral stimuli. In addition to the effects of stimulus presentation order and surgery type described above, the type of phobic stimulus undoubtedly had an impact. First, it is possible that a videotaped portion of a surgery is less aversive than, for example, mutilation scenes such as injuries, accidents, etc. Additionally, although the two surgery scenes were taken from an apparently powerful phobic stimulus of thoracic operations (Ost, Sterner, & Lindahl, 1984), the presentation methods differed markedly. Ost and colleagues showed a continuous 30 minute videotape that included scenes of the full human patient during surgery. In the current study, the elimination of scenes showing the patient's face or full body might have reduced the negative impact of the stimulus. Indeed, during debriefing, many phobics noted that the operation seemed somewhat unreal, partly because they did not know for sure that a human was undergoing surgery. Finally, unlike the methodology of Ost and colleagues in which the 30 minute stimulus was not

stopped until fainting or continuous avoidance occurred, this study's use of a 60 s stimulus permitted the collection of uniform data for all subjects but probably also decreased exposure intensity. In summary, a more intense phobic stimulus probably would have increased group differences.

Notes

[1] An attempt was made to assess feelings of faintness and of nausea independent from the three SAM scores by presenting two VPM-generated visual analog scales to subjects following each of the SAM ratings. Scores from these faintness and nausea scales were found to be highly correlated with the self-reported displeasure (r = .66 and .70, respectively), to be much more highly endorsed by females (unlike the three SAM measures), and to be highly skewed with most scores being zero. Additionally, given the experimental nature of these scales and the lack of prior psychometric data, these scales are not presented in this manuscript.

[2] When examining the effects of Surgery and Order on facial disgust, three levels of disgust would have resulted in unacceptably low sample sizes for chi-square analyses. Thus, for these analyses, a single "low" category was created by collapsing the "none" and "low" categories.

[3] Chi-square analyses across stimuli (within-subjects) must not violate the assumption of independent observations; therefore, these analyses for avoidance and facial disgust utilized McNemar's (1969) suggestion to determine if the number of subjects who, for example, showed avoidance differentially during the two videotapes varied significantly from expected. The null hypothesis in this case is that the number of subjects who avoided the surgical videotape but not the neutral videotape equals the number of subjects who avoided the neutral videotape but not the surgery. Chi-square goodness of fit tests evaluated this hypothesis.

[4] The small number of subjects who showed differential avoidance to the two videotapes precluded an analysis of the effects of surgery type and presentation order.

STUDY 2

Introduction

The goals of Study 2 were to a) evaluate the presence and extent of habituation to repeated exposures to a surgical visual stimulus and dishabituation to a novel surgical stimulus; b) assess the effect on habituation and dishabituation of preparing blood phobics by providing either a relevant description of the upcoming surgery or a neutral control description; and c) examine how imagery ability and coping style moderate the effects of preparation and repeated exposures.

Exposure and Affect Change

A wealth of clinical data strongly supports the proposal that exposure--by various means--changes affect (Barlow, 1988; Foa & Kozak, 1985; Marks, 1978). In particular, these researchers agree that exposure to anxiety-evoking stimuli produces the changes noted during treatment of anxiety disorders and phobias. It is noteworthy that each of the therapeutic interventions for blood phobia noted in the General Introduction incorporates some form of exposure to blood-relevant material.

Yet few studies have examined the process of emotional change during exposure to aversive stimuli in blood phobia. Hare et al. (1971) studied normal adults and found that

repeated presentations of the same mutilation slide resulted in rapid physiological habituation, whereas different mutilation slides interfered with habituation. Similar studies have presented mutilation slides with the purpose of studying orienting and defense reactions in blood phobics (Klorman et al., 1975, 1977). The use of repeated exposure to videotapes or films is rare (see Klorman, 1974 for an exception) and has not been conducted with blood phobics. It is difficult to achieve prolonged exposure in blood phobia without incorporating syncope-preventing strategies or suffering missing data. Therefore, the current paradigm used brief, repeated exposures to surgical stimuli to produce habituation in blood phobics.

Studies of repeated exposures to aversive stimuli typically have not examined the generalization of reduced affect to related stimuli once extinction or habituation to one stimulus has occurred. Yet repeated visual exposures to a blood-related stimulus may result in reduced negative affect to a novel blood-related stimulus secondary to modifications in the "blood-related" emotional network.

Preparatory Information

Exposing subjects to films was the paradigmatic approach of Lazarus and colleagues, who explored the efficacy of verbal "defensive sets" to modify stress responses during mutilation and other stressful films (Lazarus & Alfert, 1964; Lazarus, Speisman, Mordkoff, & Davison, 1962; Speisman, Lazarus, Mordkoff, & Davison,

1964). In these studies, introductory statements or film soundtracks were modified to induce "intellectualization" or "denial" sets. The finding of group differences on some physiological measures prompted the authors' claim that defensive sets effectively "short-circuited" stress. Alternatively, the presentation of accurate preparatory information may have led to decreased physiological arousal.

A large literature indicates the need to consider the affect-modifying role of preparatory information. Many studies have demonstrated that preparing medical and dental patients with information about upcoming aversive procedures reduces physiological arousal, behavioral escape or avoidance, and subjective distress at various points before, during, and after the procedure (Anderson & Masur, 1983; MacDonald & Kuiper, 1983; Rogers & Reich, 1986; Silver & Wortman, 1980). These preparation researchers have not discussed the affect-modifying effects of information in an emotional imagery framework (Hebb, 1968; Lang, 1979, 1985). In this view, a perceptual-motor memory is activated, observable visceral and motor responses occur, and modification of the memory's stimulus, meaning, and response propositions is facilitated. Thus, preparatory information may reduce fear of an event by activating the relevant emotional network and permitting fear modification.

Several individual difference variables may influence the effect of preparatory information and/or the change in affect across exposure repetitions. First, individuals

differ in their ability to create vivid images from verbal prompts, with resulting differences in visceral activity, and these imagery ability differences can be reliably assessed via questionnaire (Miller et al., 1987). Good imagers processing fear-relevant verbal descriptions demonstrate more arousal than do poor imagers (Cook et al., 1988).

Second, a person's coping style may influence preparation effects and emotion during single or repeated presentations of an aversive stimulus. Briefly, the coping style literature claims that people consistently differ in their preferred manner of dealing with aversive stimuli. Some people preferentially gather information about and directly engage the stimulus in order to decrease negative affect. Others tend to avoid information about the stimulus and negate its relevance and impact. These two coping styles variously have been termed sensitization and repression (Byrne, 1961), confrontation and avoidance (Suls & Fletcher, 1986), and monitoring and blunting (Miller, 1980), and can be assessed reliably via questionnaires such as Miller's (1980) instrument. Prior research on preparing medical patients for noxious procedures found that continuous presentations of information decreased anxiety of monitors but increased anxiety of blunters (Shipley, Butt, & Horwitz, 1979; Shipley, Butt, Horwitz, & Farby, 1978). Of importance to the current study, information and stimulus repetition may interact with subjects' coping style,

yielding different patterns of affect change across repetitions.

Summary and Purpose of the Study

This study addressed several questions about exposure and affect change in blood phobia. First, does repeated exposure to a phobic stimulus (surgery videotape) result in decreased negative affect over repetitions? If such habituation occurs, to what degree does it generalize to a novel blood-related stimulus? These questions were addressed by exposing one group of blood phobics (Video Only Group) to seven repetitions of a surgical videotape followed by one novel surgery presentation.

Second, this study examined the effects on habituation and dishabituation of providing blood phobics with preparatory verbal descriptions before each surgery videotape exposure. Two types of verbal descriptions were used. One group of phobics (Surgery Audiotape Group) heard a factual description of the upcoming surgery before each repetition. They were compared with a control group of phobics (Neutral Audiotape Group) who heard an irrelevant preparatory description before each surgery videotape repetition. It was expected that the prepared phobics would have less negative affect than the controls during each surgery videotape. Finally, this study examined the effects of imagery ability on the affect of both groups during the preparatory descriptions, and it examined the effects of coping style on affect during surgery videotape exposures.

Method

Overview

Sixty volunteer adult blood phobics were interviewed, completed questionnaires of imagery ability and coping style, and were randomly assigned to one of three groups: Video Only, Surgery Audiotape, or Neutral Audiotape. Video Only subjects were exposed seven times to a surgical videotape, followed by a single exposure to a novel surgery. Subjects in the Surgery Audiotape and Neutral Audiotape Preparation Groups experienced a different exposure paradigm. Four presentations of a preparatory audiotape alternated with four presentations ("test trials") of a surgery videotape. Subsequently, these subjects viewed a novel surgery videotape. These two groups differed only in the type of preparatory audiotape they heard prior to each of the four surgery test trials: Surgery Audiotape subjects heard a factual description of the upcoming surgery, and Neutral Audiotape subjects heard a neutral irrelevant description. Subjective affect, physiological responses, and facial expressions of disgust and avoidance served as dependent measures for all three groups.

Subjects

Subjects were 60, 18 to 25-year-old ($\underline{M}$ = 19.7) volunteer University of Florida undergraduates currently enrolled in General Psychology. The final sample was secured after screening approximately 500 potential subjects with the Mutilation Questionnaire (MQ) at the beginning of

the semester. The highest scoring males and females were telephoned and invited to participate in a study if they spoke English and were not pregnant. One male declined to participate fearing his anticipated reaction to the stimuli, and one female with panic disorder was excluded. Mutilation Questionnaire scores of blood phobic males ($\underline{n}$ = 30) ranged from 14 to 24 ($\underline{M}$ = 17.4), and scores of blood phobic females ($\underline{n}$ = 30) ranged from 21 to 29 ($\underline{M}$ = 23.6). Approximately the upper 15th percentile of each gender distribution was used from this sample. All subjects received course credit for participating in the experiment.

Procedure

Each subject was studied individually during a 2 h experimental session.

Interview and psychometric assessment. After subjects read and signed the informed consent form (Appendix G), they completed severally randomly ordered questionnaires, including the Questionnaire Upon Mental Imagery and the Miller Behavioral Style Survey.

Experimental session. Following questionnaire completion, subjects entered the experimental room, instructions were presented (Appendix H), and the electrodes for HR and SCL and the BP cuff were attached. The cuff was inflated several times to accommodate the subject to its function. Next, all subjects had one practice videotape trial using a neutral video stimulus in order to accommodate them to the videotape presentation. The protocol for this

practice trial was the same as for all other trials described below, except that no data were collected during this practice trial. Following the practice, the experimenter reentered the room, answered the subject's questions, placed the audio headphones on the subject, and departed. In order to accommodate subjects to the headphones and the speaker's voice, subjects heard over the headphones a brief reminder about the instructions of the study (Appendix H). Following these headphone reminders, subjects rated the affect they experienced during the headphone instructions. These ratings served as the study baseline subjective ratings. Subjects then waited several minutes for the first presentation, during which the BP cuff was inflated twice, one minute apart, and the average of these two BP assessments served as the study baseline BP.

Group and stimulus assignment. Prior to the start of the study, a research assistant randomly assigned subjects to one of the three experimental groups (in blocks of three or six subjects) and matched the groups for gender, resulting in 20 blood phobic subjects--10 males and 10 females--per experimental group. The group assignment for each subject was placed in an envelope and opened by the experimenter after his last interaction with the subject prior to the start of the trials, thus keeping the experimenter blind to group assignment during his interactions with the subject. The assignment of the particular stimulus (or stimulus pair for the Neutral

Audiotape group) for each subject also was determined randomly prior to the study using Latin squares. Stimulus assignment was conducted to assure that each surgical videotape and each novel videotape were seen an equal number of times per group and per gender within each group.

Experimental paradigm. Table 8 presents the trial sequence for the study, which is detailed below for each experimental group. After the baseline recordings, the sequence of trials began. All stimulus presentations were separated by a variable length interval which averaged 1.5 minutes (range of 1 to 2 min) during which the subject remained quietly seated, waiting for the next stimulus presentation. The experimenter did not reenter the experimental room until after the final (novel surgery) trial, when he disconnected electrodes, debriefed (Appendix I), and dismissed the subject.

The structure of all of the stimulus presentations trials--both videotape and audiotape--was similar to that in Study 1.[1] Baseline HR and SCL were assessed during the 10 s immediately prior to the onset of the stimulus, which was presented for 60 s during which HR and SCL continued to be recorded. For the four "test trials" (Exposures 1, 3, 5, and 7 for the Video Only Group) and the Novel trial, the subject's face was videotaped as he/she watched the surgery videotape being presented. Faces were not videotaped during audiotape presentations. Immediately upon stimulus offset, BP was assessed, the affective ratings screen illuminated,

Table 8. Experimental Design for Study 2

	Surgery Videotape Exposure							
Video Only Group	1[a]	2	3[a]	4	5[a]	6	7[a]	Novel Surgery Video[a]

[a] Subjects' faces were videotaped for analysis of avoidance and disgust.

<table>
<tr><th colspan="10">Trial</th></tr>
<tr><th>Group</th><th>Prep 1</th><th>Test 1</th><th>Prep 2</th><th>Test 2</th><th>Prep 3</th><th>Test 3</th><th>Prep 4</th><th>Test 4</th><th>Novel</th></tr>
<tr><td>Surgery Audiotape</td><td>SURG AUDIO</td><td rowspan="2">SURGERY VIDEOTAPE</td><td>SURG AUDIO</td><td rowspan="2">SURGERY VIDEOTAPE</td><td>SURG AUDIO</td><td rowspan="2">SURGERY VIDEOTAPE</td><td>SURG AUDIO</td><td rowspan="2">SURGERY VIDEOTAPE</td><td rowspan="2">NOVEL SURGERY VIDEOTAPE</td></tr>
<tr><td>Neutral Audiotape</td><td>NEUT AUDIO</td><td>NEUT AUDIO</td><td>NEUT AUDIO</td><td>NEUT AUDIO</td></tr>
</table>

and subjects rated the affect they experienced during the stimulus.

Experimental Groups

Subjects were randomly assigned to one of three experimental groups which varied in the type of presentations they received prior to the Novel trial. For the Novel trial, all subjects were presented a novel surgical videotape, which was chosen randomly from among the surgical videotapes not used for that subject; assignment of novel stimulus was conducted to assure that all surgeries were presented equally often within and between experimental groups and for each gender. The details of stimulus presentation for each of the three experimental groups were as follows:

Video Only Group. The function of this group was to evaluate the affect change during multiple repetitions of a single surgery videotape followed by a novel surgery. Thus, these 20 blood phobics were presented one particular surgery scene seven times (listed in Table 8 by Exposure number), followed by a single presentation of a novel surgery.[2] Although these subjects wore the headphones just like other subjects, they heard no audiotaped stimulus descriptions during the study.

Two other groups were studied to compare the effects of relevant and control preparatory verbal descriptions. For these two groups, there were four preparation trials during which an audiotaped description was presented repeatedly,

four test trials during which a particular surgery videotape was presented repeatedly, followed by one presentation of a novel surgery videotape.

Surgery Audiotape Group. During the four preparation presentations, each subject in this group heard a relevant and factual description of the upcoming surgery that was presented during each of the four test trials. For each subject, the audiotape was repeated four times, because the same surgery videotape was repeated on the four test trials.

Neutral Audiotape Group. This group served as a control for the Surgery Audiotape group. Each subject heard a neutral audiotape description as "preparation" prior to each test trial. Like the Surgery Audiotape subjects, these subjects heard the same neutral audiotape for the four preparations. On the four test trials they repeatedly viewed one of the surgery videotapes, prior to viewing the novel surgery videotape for the final trial. The inclusion of this group permitted a controlled evaluation of the effects of listening to a scene that lacked phobic content.

Stimuli

Three types of stimuli were used in this study, each of which had five exemplars. First, in addition to the two surgical videotapes employed in Study 1 ("Incision" and "Tubes"), three additional 60 s surgical videotapes were taken from Ost's film of thoracic operations. The three additional video stimuli were the following: "Rib," which showed a tool cleaning and removing a rib; "Heart," which

showed a beating heart being punctured with an instrument and then sutured to stop bleeding; and "Sutures," which showed the chest incision being sutured with needles and thread. Blood and bodily deformation are depicted in all five scenes. For each subject, one of these five surgery videotapes was repeatedly presented, and one of the remaining four was presented during the novel trial.

Sixty second audiotaped descriptions of each surgery videotape were employed. In addition to the two audio descriptions of "Incision" and "Tubes," three additional audiotapes of 160 words narrated the three additional surgery videotapes used in this study. The same female voice recorded all audio stimuli in an affectively neutral manner. These audiotapes were presented only to the Surgery Audiotape subjects, and the surgery audiotape selected for that subject was one that described the surgery videotape that had been assigned to the subject.

The third category of stimuli were audiotaped verbal descriptions of neutral, everyday activities. Five audiotaped narratives, 60 s in duration, and 160 words long, were recorded by the same female assistant who recorded the surgical audiotape descriptions. The five neutral descriptions included a person baking a cake, planting in the garden, typing on a typewriter, paddling a canoe, and flying a kite. These scenes were expected to be neutral in affective content, yet all described human hand movement, which was similar to the descriptions in the surgical

audiotapes. Only subjects in the Neutral Audiotape Group heard these descriptions. Each neutral description was presented an equal number of times with ordering of presentation determined via a Latin square. (See Appendix E for the transcripts of the five verbal and five neutral descriptions.) In summary, since there were five surgery and audiotape exemplars, four subjects of the 20 in each experimental group received the same stimulus or stimulus pair.

The practice neutral videotape stimulus which preceded the experimental trials was a silent, 60 s videotape of a scene from Jonathon Livingston Seagull which shows a seagull in flight over mountains and the ocean.

Questionnaires

The Mutilation Questionnaire and the Questionnaire Upon Mental Imagery were already described in Study 1. The additional questionnaire of interest in this study was the Miller Behavioral Style Scale (MBSS). Miller (1980) developed this instrument to assess a subject's preferred coping style under stressful circumstances. The scale asks the subject to imagine being in four stress-evoking situations. Each scene is followed by eight statements representing different ways of coping with the situation. Four of the statements relate to confronting and seeking information (a "monitoring" style), and the other four statements indicate distracting and avoiding information ("blunting"). Separate monitoring and blunting scores are

obtained by summing the number of statements endorsed for each coping style. The scale has good discriminant validity (Miller, 1987a; Miller, Brody, & Summerton, 1988) and predictive validity (Gard & Edwards, 1986; Miller, 1987a, Phipps & Zinn, 1986, Watkins, Weaver, & Odegaard, 1986).

Dependent Measures

Three classes of dependent measures were assessed in this study. Subjective measures included self-reported displeasure, arousal, and lack of control, for which change scores were calculated by subtracting the study baseline value from the value obtain for each stimulus presentation. Physiological measures of HR and SCL change scores were calculated by subtracting the trial baseline mean (the 10 s prior to stimulus onset) from the mean value obtained during the stimulus. The two BP measures were derived by subtracting the study baseline from the values obtain after each stimulus.

Motor behavior measures of avoidance and maximum facial disgust were coded by two independent raters from the videotape of the subject. Avoidance was coded dichotomously based on at least 1 s of avoidance. The 5-point rating of maximum facial disgust was reduced to a dichotomous code to provide a sufficient number of subjects for frequency analyses; original scores of 0 or 1 were classified as "low" disgust, and scores of 2, 3, or 4 were classified as "high" disgust. Percent agreement for these two measures was calculated between the two independent raters' dichotomous

classifications. For avoidance, percent agreement ranged from 92% to 97% for the five trials. For maximum facial disgust, percent agreement ranged from 93% to 98%. Thus, acceptable interrater reliability was achieved.

This study used the same environment and apparatus as in Study 1. A separate VPM control program was written to assess physiology and present stimuli (Appendix J).

Results

Three major issues were addressed in this study. In the first section below, changes in affect to repeated surgical exposures and to a novel surgery were evaluated using data from the Video Only Group. In the second section, the Surgery Audiotape and Neutral Audiotape groups were compared to evaluate the effect of auditory preparation on affect during repeated surgery presentations. In the third section, the influence of imagery ability and coping style on affect for those two groups of subjects who received auditory preparations was examined.

Effects of Repeated Visual Exposure

The 20 subjects of the Video Only Group viewed one surgery videotape seven times prior to viewing a novel surgery. The dependent measures of displeasure, arousal, lack of control, SCL, HR, SBP, and DBP were assessed during each of these eight exposures. These measures were analyzed with a repeated-measures ANOVA in which Trial (eight levels) was the within-subject effect. The use of Greenhouse-Geisser corrections resulted in fractional degrees of

freedom. Planned contrasts between exposures were conducted to more thoroughly evaluate affect change.

<u>Self-report measures</u>. Table 9 presents displeasure, arousal, and lack of control change scores from baseline over the seven exposure trials and the Novel Exposure for Video Only subjects. As indicated by significant Trial effects and planned contrasts between exposures, all three variables showed a significant reduction in negative affect from Exposure 1 to Exposure 7, and a significant and immediate return of negative affect to the Novel Exposure to levels not significantly different from those reported during Exposure 1 (all $p > .42$). At Exposure 7, arousal and lack of control did not differ from their study baselines ($p > .65$), although displeasure remained above its baseline value, (Trial effect: displeasure, $F(3.2, 60.3) = 8.61$, $p < .0001$; arousal, $F(2.8, 52.6) = 10.34$, $p < .0001$; lack of control, $F(3.0, 56.7) = 7.76$, $p < .0002$.

<u>Physiological measures</u>. Figure 2 presents the SCL and HR change data for the Video Only subjects on the same graph for easy comparison. The trend in SCL and HR parallels that of the self-report data, although only for SCL was there a significant Trial effect, $F(2.6, 49.1) = 4.28$, $p = .012$. The SCL habituated rapidly after an initial elevation during Exposure 1, dropped significantly to its lowest value during Exposure 5 (which was not significantly different from baseline, $p > .44$), and then increased somewhat (although nonsignificantly) during the Novel surgery. The SCL during

Table 9. Changes in Self-Report and Motor Measures Across Repeated Surgery Videotape Exposures and a Novel Surgery for the Video Only Group

	Exposure							
Measure[a]	1	2	3	4	5	6	7	Novel
Displeasure	6.5 (4.0)	5.9 (3.6)	4.9 (3.6)	4.6 (3.7)	3.8 (4.0)	3.4 (4.7)	3.7 (4.5)	7.2 (8.2)
Arousal	5.9 (8.2)	4.4 (8.3)	3.5 (8.2)	2.2 (8.0)	1.2 (7.9)	0.8 (7.8)	0.4 (7.9)	6.4 (7.5)
Control Lack	5.3 (5.8)	4.7 (6.1)	3.4 (6.3)	1.9 (6.6)	1.3 (7.2)	1.2 (6.7)	0.7 (6.9)	5.7 (7.1)
Avoidance (Yes/No)	8/12		9/11		5/15		10/10	9/11
Disgust (High/Low)	10/10		6/14		6/14		5/15	9/11

[a] Means (and standard deviations) are presented for the self-report measures; frequency data are presented for the motor measures.

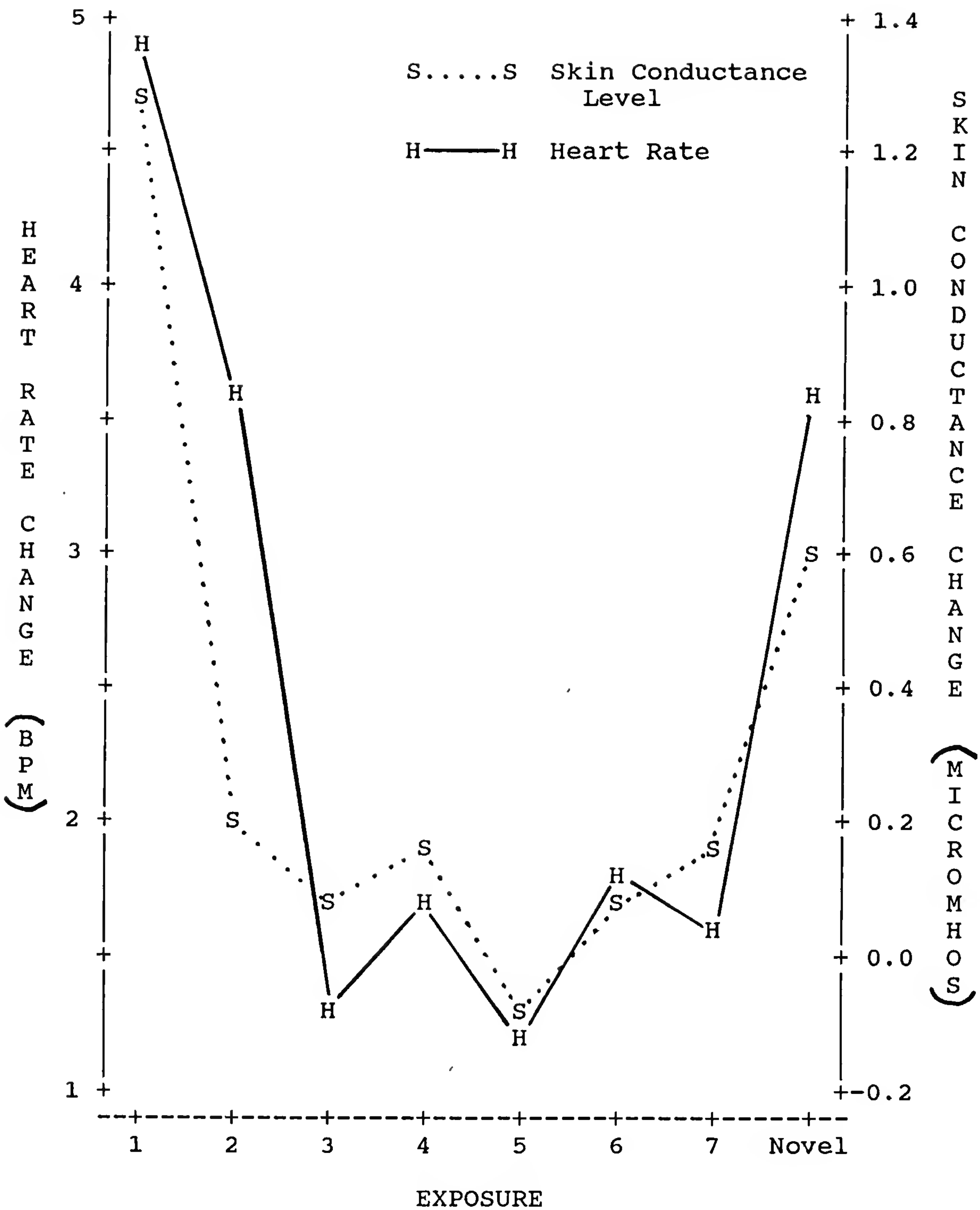

Figure 2. Changes in Heart Rate and Skin Conductance Level Across Seven Surgery Videotape Exposures and the Novel Surgery Exposure for the Video Only Group

the novel surgery did not differ from that during Exposure 1 ($p > .12$). Neither SBP nor DBP change scores showed a statistically reliable trend across exposures.

Motor behavior measures. The motor measures of avoidance and facial disgust were assessed during only Exposures 1, 3, 5, 7, and the Novel Exposure and are presented in Table 9. These dichotomous measures were analyzed via chi-squares using McNemar's (1969) recommendation for within-subject analyses. As can be seen, avoidance behavior remained at a relatively constant level across the four exposures and the novel surgery, except for a nonsignificant drop in avoidance during the Exposure 5. For facial disgust, half of the Video Only subjects showed "high" disgust during Exposure 1; this frequency decreased in subsequent exposures and the difference reached statistical significance at Exposure 7, $X^2(1) = 5.0$, $p < .05$. Additionally, significantly more subjects increased than decreased disgust from Exposure 7 to the Novel Surgery, $X^2(1) = 4.00$, $p < .05$. Disgust during the novel surgery and Exposure 1 did not differ.

Effects of Auditory Preparation

The effects of auditory preparation were examined by comparing the affect of the relevantly-prepared Surgery Audiotape Group with the control Neutral Audiotape Group at the four videotape "test trials" and the novel surgery.[3] Data analyses used mixed-model repeated measures ANOVAs in which Group (Surgery Audiotape or Neutral Audiotape) was the

between-subjects effect and Trial (five levels) was the within-subject effect. Greenhouse-Geisser corrections were applied.[4]

Self-report measures. Figure 3 shows the displeasure change during each of the four test trials and the novel trial for Surgery Audiotape and Neutral Audiotape subjects. For all three self-report measures, negative affect decreased significantly between Test Trials 1 and 4 and increased significantly from Test Trial 4 to the Novel Surgery (all $p < .007$). Group differences were of greater interest, however. As Figure 3 suggests, Surgery Audiotape subjects reported less displeasure than the Neutral Audiotape subjects across trials, Group main effect, $F(1, 38) = 4.40$, $p = .042$. The Trial X Group interaction was not significant, indicating that the group difference in displeasure did not change across trials. Lack of control followed a similar trend across trials in that the sample mean of the Surgery Audiotape Group suggested they had less lack of control than the Neutral Audiotape Group; however, this Group main effect failed to reach significance, $p = .16$. Self-reported arousal was similar for the two groups across all trials.

Physiological measures. Figure 4 shows the change in SCL across the four test trials and novel trial for the two groups. There was a significant decrease in SCL over the four test trials and increase during the Novel Trial, ($p < .001$). More importantly, Figure 4 suggests that the SCL of

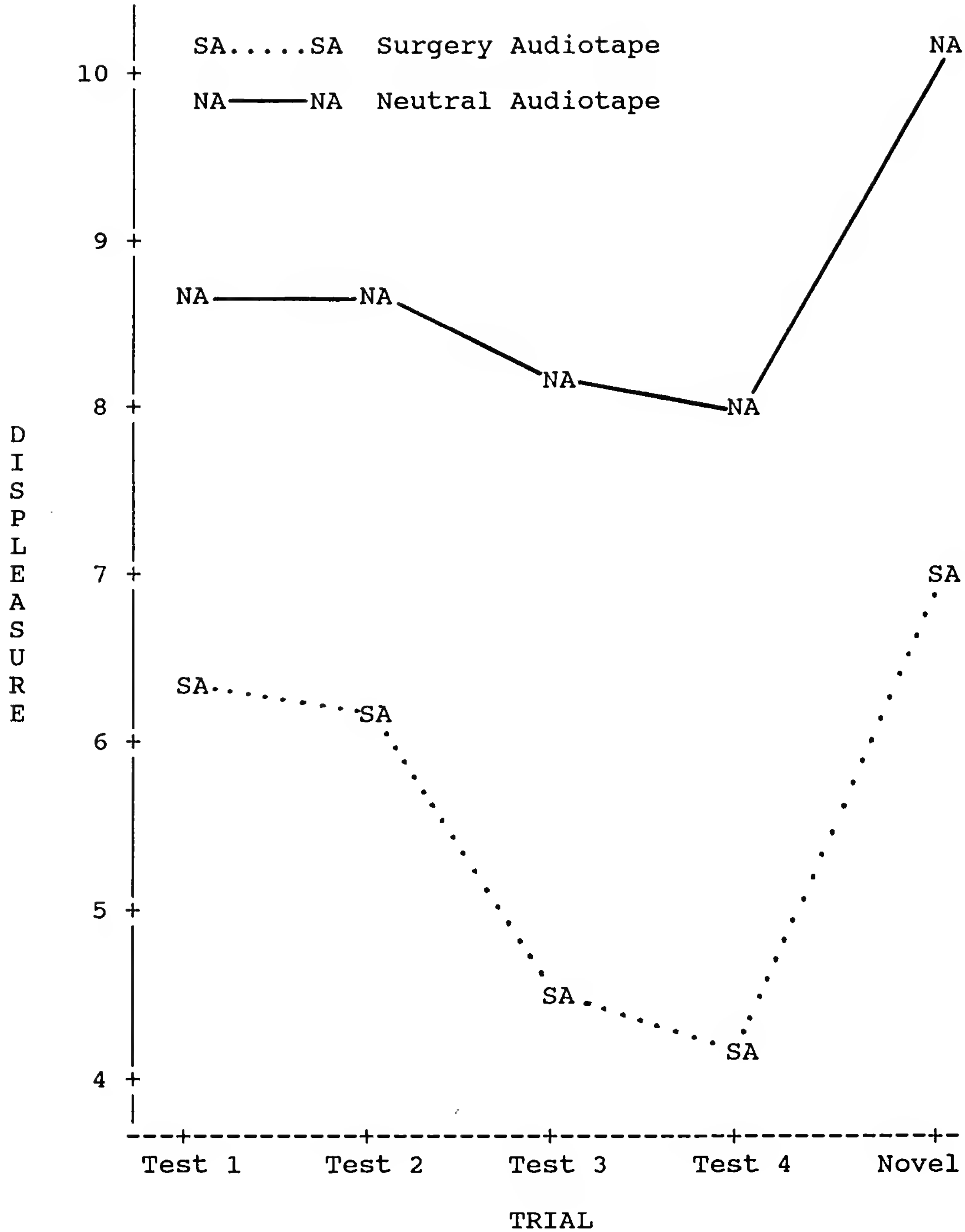

Figure 3. Self-Reported Displeasure Change Across Four Surgery Videotape Test Trials and the Novel Surgery Trial for the Surgery and Neutral Audiotape Groups

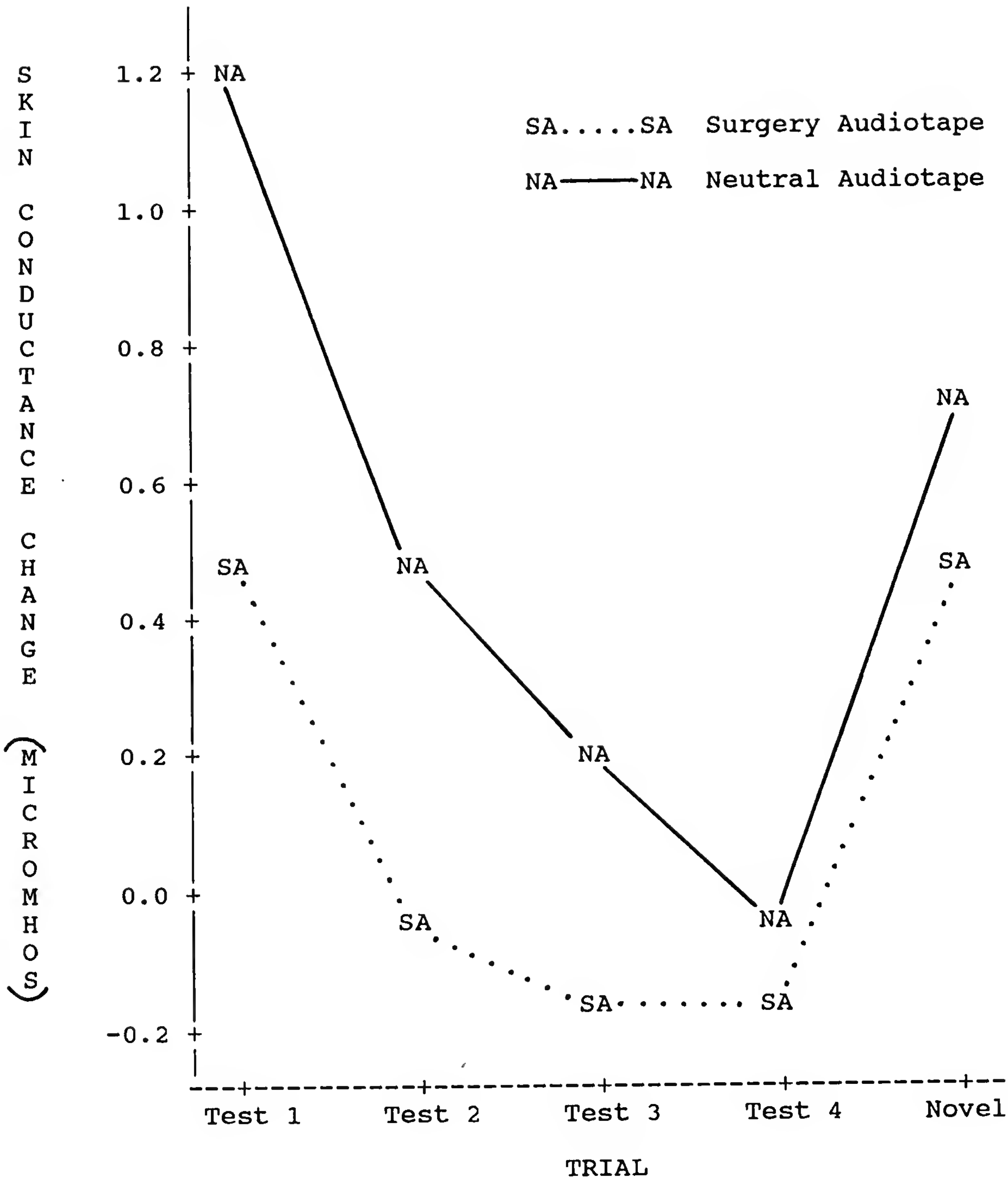

Figure 4. Skin Conductance Level (60 s Mean) Change Across Four Surgery Videotape Test Trials and the Novel Surgery Trial for the Surgery and Neutral Audiotape Groups

the Surgery Audiotape Group was less than that of the Neutral Audiotape Group; however, the Group main effect only neared significance, $F(1, 38) = 2.73$, $p = .10$. Nonetheless, simple effects analysis revealed that at Test Trial 1, the SCL of the prepared subjects was less than that of the control subjects, $p < .03$. There was no Trial X Group interaction. The HR, SBP, and DBP changes did not differ significantly across trials or between groups.

Motor behavior measures. Table 10 presents avoidance and facial disgust frequency data for the Surgery Audiotape and Neutral Audiotape Groups. Consistent with the findings for displeasure and SCL, these motor measures indicated that the prepared subjects had less negative affect during the surgery videotapes than the control subjects.

Avoidance did not change significantly for either group across the five trials. "High" disgust for the Neutral Audiotape subjects steadily declined from Test Trial 1 to Test Trial 4, $X^2(1) = 7.0$, $p < .01$; the fairly low disgust displayed by the Surgery Audiotape subjects did not decrease across test trials. Both groups had significantly more subjects increase than decrease disgust from Test Trial 4 to the Novel Trial, (Surgery Audiotape, $X^2(1) = 4.00$, $p < .05$; Neutral Audiotape, $X^2(1) = 7.00$, $p < .01$).

Next, differences at each trial were examined. The Surgery Audiotape Group tended to avoid less frequently than the Neutral Audiotape Group at Test Trials 1 and 4, ($X^2(1) = 2.50$ and 7.06, $p = .114$ and $.058$, respectively), and they

Table 10. Frequency of Avoidance and Facial Disgust Across Four Test Trials and the Novel Surgery for Surgery Audiotape and Neutral Audiotape Groups

Behavioral Measure	Trial				
Avoidance (Yes/No)	Test 1	Test 2	Test 3	Test 4	Novel
Surgery Audiotape	2/18	2/18	4/16	2/18	0/20
Neutral Audiotape	6/14	10/10	7/13	7/13	6/14
Disgust (High/Low)					
Surgery Audiotape	4/16	1/19	1/19	1/19	5/15
Neutral Audiotape	11/9	9/11	6/14	4/16	11/9

avoided significantly less often than the control subjects during Test Trial 2 and the Novel Trial, ($X^2(1) = 7.62$ and 7.06, $p = .006$ and .008, respectively). The Surgery Audiotape Group had significantly fewer "high" disgust subjects than the Neutral Audiotape Group during Test Trials 1, 2, 3, and the Novel Trial, ($X^2(1) = 5.23$, 8.53, 4.33, and 3.75; $p = .022$, .003, .037, and .053, respectively).

Effects of Personality Variables

Two personality variables, imagery ability and coping style, were examined for their influence on affect of subjects receiving preparation--the Surgery Audiotape and Neutral Audiotape Groups. Analyses used repeated-measures ANOVAs with Group and the personality measure as between-subjects effects; personality measures were left continuous for the ANOVA, but were dichotomized via a median split for chi-square analyses of their relationship with avoidance and disgust and for graphic presentation.

Mental imagery ability (QMI). Imagery ability was hypothesized to influence affect during the auditory preparation trials; thus, affect during Preparations 1 and 2 was analyzed. Only self-reported lack of control was related significantly to imagery ability. Examination of the plotted data revealed an effect of little interest: the lack of control of good imaging Neutral Audiotape subjects, (but not Surgery Audiotape subjects) was lower during both of the neutral audiotape descriptions, (QMI X Group, $F(1, 36)$, $p = .033$).

Coping style (MBSS). The MBSS yielded both Monitoring and Blunting scores which were not correlated in this sample of 40 subjects, ($r(38) = -.16$, $p = .31$); therefore, each variable was examined separately. Coping style was expected to relate to emotional responding during the actual presentation of the surgery stimuli. Thus, repeated-measures ANOVAs and chi-squares examined each variable during Test Trials 1 and 2 and again during Test Trial 4 and the Novel Surgery.

The Monitor variable was related to only one dependent measure; all five of the Surgery Audiotape subjects who showed "high" disgust to the Novel Surgery were low in Monitoring, $X^2(1) = 6.67$, $p = .01$.

The Blunting variable, however, showed several interesting relationships with various dependent measures. The self-report measures were related to Blunting during Test Trials 1 and 2, whereas several of the physiological measures were related to Blunting during Test Trial 4 and the Novel Surgery. Across Test Trials 1 and 2, high blunting subjects reported a rise in displeasure, whereas low blunting subjects reported an decrease in displeasure, regardless of Group, (Trial X Blunting interaction, $F(1, 36) = 5.10$, $p = .03$). The analyses of arousal and lack of control across Test Trials 1 and 2 were consistent with displeasure and even more revealing in that the groups differed. The interactions for both dependent measures were interpreted similarly; therefore, only arousal change scores

for the two groups as a function of blunting are presented in Figure 5. As the figure reveals, Surgery Audiotape high blunters reported increased arousal and lack of control across the two surgery presentations, whereas low blunting Surgery Audiotape subjects reported a reduction in arousal and lack of control. Neutral Audiotape subjects, however, showed little change in arousal or control across these surgeries as a function of blunting; indeed, Neutral Audiotape high blunters reported somewhat greater arousal and lack of control during these presentations than low blunters (Trial X Group X Blunting interactions for arousal, $F(1, 36) = 8.78$, $p = .005$; and lack of control, $F(1, 36) = 13.44$, $p = .0008$).

Blunting was related also to affect during Test Trial 4 and the Novel Surgery. For SCL, collapsing across both trials, the Surgery Audiotape high blunters tended to have a higher SCL than Surgery Audiotape low blunters, whereas Neutral Audiotape high blunters had a lower SCL than Neutral Audiotape low blunters, (Group X Blunting, $F(1, 36) = 3.75$, $p = .06$). The two BP measures specified these effects for each trial, and since the interpretation of the interactions is similar, only SBP data for both groups over both surgery presentations as a function of Blunting is presented in Figure 6. Consistent with SCL, SBP and DBP increased from Test Trial 4 to the Novel Trial for high blunting Surgery Audiotape and low blunting Neutral Audiotape subjects, whereas SBP and DBP showed little change across surgery

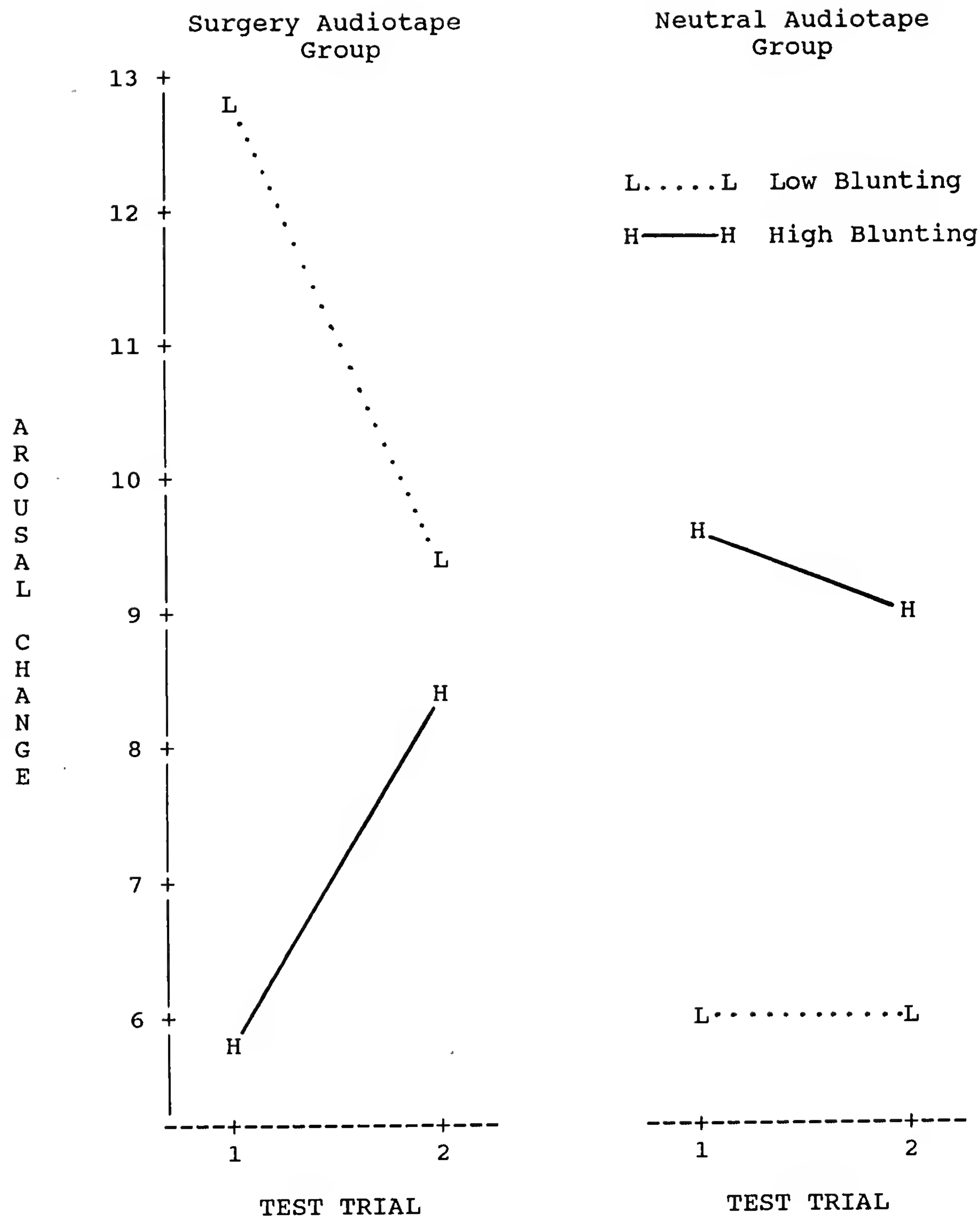

Figure 5. Arousal Change Across Test Trials 1 and 2 for the Surgery Audiotape and the Neutral Audiotape Groups as a Function of Blunting

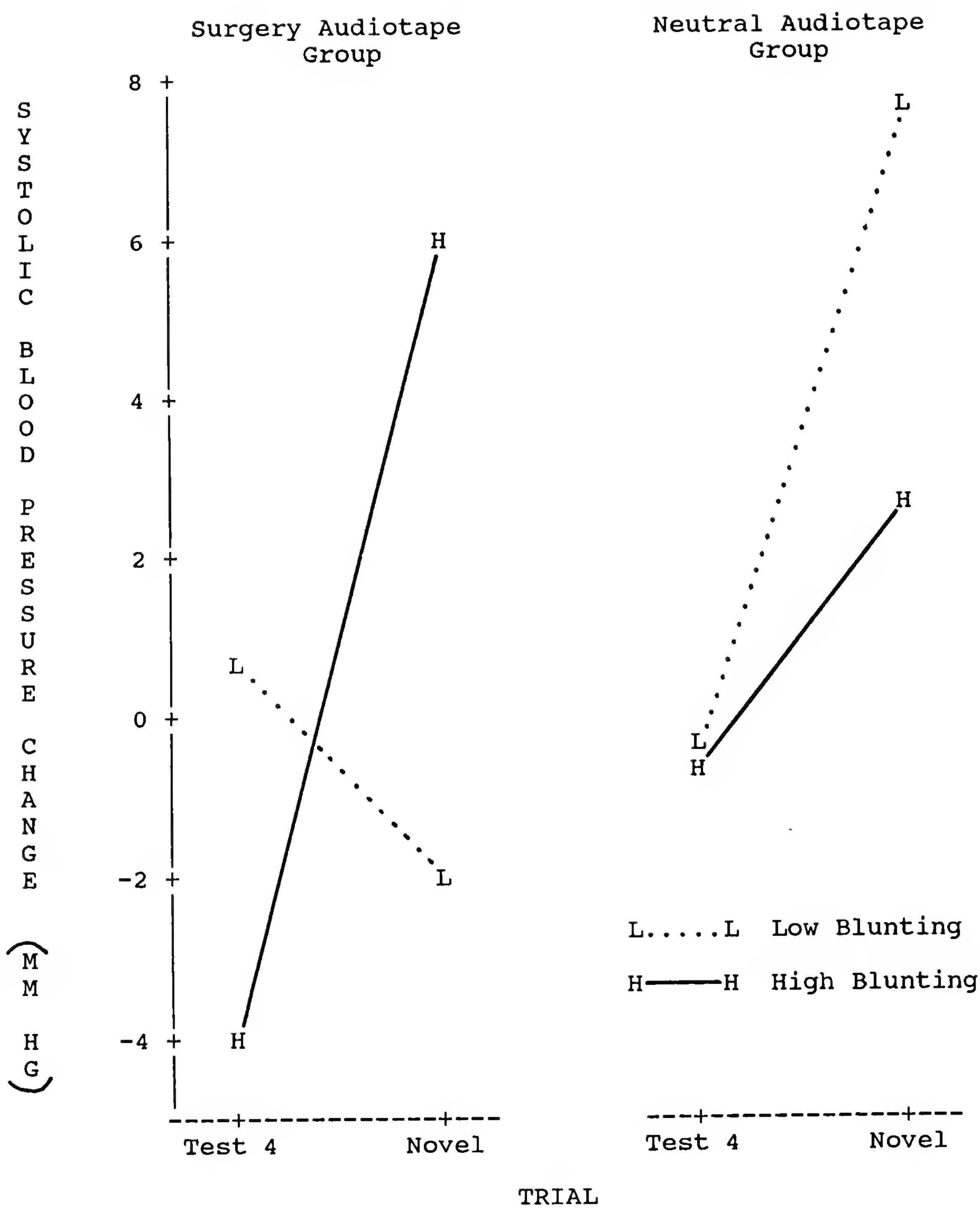

Figure 6. Systolic Blood Pressure Change Across Test Trial 4 and the Novel Trial for the Surgery Audiotape and the Neutral Audiotape Groups as a Function of Blunting

presentations for low blunting Surgery Audiotape and high blunting Neutral Audiotape subjects, (Trial X Group X Blunting interactions for SBP, $F(1, 36) = 8.35$, $p = .0065$; and DBP, $F(1, 36) = 5.12$, $p = .030$). Finally, findings for self-reported arousal were not completely consistent with the physiological data. Both Neutral Audiotape and Surgery Audiotape low blunters reported a greater increase in arousal from the Test Trial 4 to the Novel Trial than did the high blunters, (Trial X Group X Blunter interaction, $F(1, 36) = 4.86$, $p = .034$).

Discussion

Affect Change to Repeated Surgery Exposures

A fundamental question regarding emotional change is whether blood phobics become less uncomfortable or anxious as a phobic stimulus is presented repeatedly. This study indicated that such change does occur. Indeed, in a sample of 20 phobics who viewed one surgery stimulus repeatedly for seven trials, there was a significant decline on most measures of negative affect across repetitions. This finding supports a basic premise of emotional functioning--exposure leads to reductions in negative affect (Foa & Kozak, 1986).

Similar findings were reported by Hare et al. (1971) who demonstrated habituation of arousal with multiple repetitions of mutilation scenes. Hare and colleagues studied normals using slides; the current study extends their findings to blood phobics viewing videotapes.

Generalization of Affect Reduction to Novel Phobic Stimuli

A second question of fundamental importance concerns the extent to which the attenuation of emotion which occurred during repeated presentations generalized to new blood-related stimuli. The results of the current study indicated that, although the aversive qualities of a particular blood-related stimulus attenuated fairly quickly to repetition, very little or no generalization occurred. Indeed, when a novel surgery scene was presented, there was a substantial return of negative affect to levels not different from those observed during the first presentation of the surgery scene. Using a different paradigm, Hare et al. (1971) found that presenting different mutilation slides interfered with habituation. Limited generalization to a novel stimulus might be viewed as secondary to affective network changes in only those specific stimulus properties shown in the repeated surgery scene, rather than to a elaborated network of "blood-related stimuli." A further test of generalization might be to repeatedly present the "novel" stimulus. If the rate of habituation to it is faster than to the original stimulus, evidence for some generalization of affect reduction would be adduced.

Effects of Preparation

A second portion of this study examined the effects of two types of preparation for upcoming surgery videotape exposures. The prepared group of blood phobics heard an accurate, affectively neutral description of the surgery

prior to each of four viewings. Their affect during the four repeated exposures and during a novel stimulus was compared to that of a control group of subjects who heard a neutral, unrelated audiotaped description before each exposure.

Generally, the relevant preparation produced only modest reductions in negative affect during exposure, compared with the control preparation. The relevantly prepared group reported significantly less displeasure and showed less facial disgust and avoidance than did control subjects. The lack of control and SCL change showed similar although less reliable trends. Preparation effects tended to be somewhat more evident during the first surgery exposure than later exposures. Thus, although the effect does not appear robust, there is tentative support for the hypothesis that preparing blood phobics to view a surgery by providing them a description modestly reduces negative affect in comparison to an irrelevant preparation.

Admittedly, however, group differences were limited with respect to the number of variables differentiating conditions and the magnitude of the effects. One important potential reason for the limited effects is that the current paradigm simply did not permit large effects. In this study, the experimental manipulation was a variation in preparation for blood phobics viewing surgeries; one might expect rather small or even absent effects from this manipulation, especially in light of the limited effects

found in Study 1, where powerful experimental conditions were created (phobics versus nonphobics, aversive versus neutral material).

The content of the preparatory audiotapes may further account for limited effects. The affect of the Surgery Audiotape group during the first audiotape presentation was minimally negative; only two subjective measures indicated increased arousal. The narrative of each audiotape was affectively neutral and purely descriptive of the surgery; it contained no references to the observed patient's experience of the surgery nor to the subject's possible reaction during viewing. The empirical literature on preparation for stressful procedures has demonstrated that verbal preparations which include not only descriptions of upcoming procedures but also of the sensations that the patient or listener might experience, (i.e., sensory information) often result in less anxiety during and after the stressful event (Anderson, & Masur, 1983). A different domain of empirical inquiry--affective imagery--suggests that verbal scripts for emotional imagery evoke increased affect when they include response propositions, or descriptions of the imaging person's affective reactions in the imaged scene (Lang, Kozak, Miller, Levin, & McLean, 1980; Lang, Levin, Miller, & Kozak, 1983). Additionally, the current subjects were instructed only to listen to the description, whereas other research has demonstrated that instructions to vividly imagine oneself in the scene elicits

greater affect during imagery (Lang, 1979). Thus, the preparatory capacity of the audiotaped descriptions might have been enhanced by modifying the instructions and incorporating response propositions.

Individual Difference Variables

Finally, another reason for limited group preparation effects is the variability in affect accounted for by individual differences, especially in coping style. Imagery ability was assessed also, but it was found to have little relation to affect during the verbally presented preparation descriptions, where imagery effects might have been expected to occur.

The effects of coping style appear to be more robust, however. The monitoring style was limited in its relation to affect during the surgery videotapes. Its one relationship was consistent with the effects of the blunting style and is described below. The blunting coping style was related to increases or decreases in self-reported affect and physiology from the first to the second surgery videotape presentation and the fourth surgery to the novel presentation. Moreover, blunting coping style interacted with the type of preparation given to subjects, yielding different relationships for the two preparation groups.

Among the relevantly prepared subjects, blunters reported lower levels of negative affect to the first surgery presentation, but their negative affect increased during the second surgery presentation. Subjects who

typically avoid blunting reported greater negative affect on the first presentation, but their anxiety decreased to the second surgery. The unprepared subjects did not show this effect, but tended to display the opposite relation.

Similar effects occurred during the presentation of a novel surgery as indexed by physiological measures. Prepared subjects who blunt showed an increase in physiological arousal to the novel surgery compared with prepared subjects who do not blunt. Also, prepared subjects who were low on monitoring (typically considered as similar to blunting) had the greatest facial disgust to the novel surgery. Again, unprepared subjects did not show this pattern of results. In the transition from the repeated surgery to the novel surgery, unprepared control subjects who do not blunt had increased physiological arousal.

The findings with the prepared subjects are consistent with those of Shipley and colleagues (1978, 1979) who found that repressors (like blunters in the current study) became more anxious (indexed by tachycardia) during a second presentation of a surgery preparation videotape, whereas sensitizers were more anxious during the first presentation and became less so during a second viewing. This study extends their findings by suggesting that when a novel surgery is shown later in the repetition sequence, low blunters (like sensitizers) continue to show reduced affect, but blunters (like repressors) are increasingly disturbed

and unable to blunt as successfully as they did during the initial presentation.

The different relationship of blunting with affect for the preparation and control groups is interesting. It is possible that the surgical descriptions for the prepared subjects permitted almost continuous activation of their affective networks, with the result that the subjects' preferred manner of coping with aversive stimuli had predictable effects over exposures. However, providing other phobics irrelevant, potentially distracting descriptions prior to each viewing might have precluded continuous activation of the emotion, with the result that low blunters were unable to decrease their arousal over presentations, and high blunters successfully maintained affective distance. Naturally, these explanations are speculative, and since the construct of coping style is itself poorly understood, it is quite difficult to enlighten the complicated interaction of coping style with variations in exposure. Further theory and research which addresses the mechanism by which coping style influences emotional network activation is needed.

Methodological Issues

Study 2's methodology had several problems which hindered clear interpretations of the results and probably reduced the size of observed effects. First, the study used five different surgery scenes rather than a single scene or two, as in Study 1. It was hoped that multiple surgeries

would increase the generalizability of the findings to a larger population of blood-related stimuli. Although no experimental confound occurred (each surgery was used equally often), the increase in response variation attributable to the use of multiple surgeries probably resulted in increased between-subjects variance and a concomitant decrease in statistical power. Additionally, too many surgeries were employed to permit adequate statistical comparisons of their affect-eliciting power. Ideally, the same two surgeries used in Study 1 should have been employed in Study 2 to more clearly replicate and extend the findings of Study 1.

Second, avoidance and facial disgust should have been recorded during verbally presented descriptions in both studies. Bioinformational theory predicts that various stimulus modalities reliably activate affective networks, resulting in measurable efferent outflow (Lang, 1979). Thus, future research should include facial affect assessments during verbal stimulus trials. A more important experimental concern is that no baseline avoidance or facial affect measures were recorded; thus, it is possible that the observed differences between groups were attributable to preexisting differential tendencies to avoid or show disgust. An acceptable baseline might be obtained by presenting a stimulus that lacks the phobic content under study, but is hypothesized to be equally bothersome to all

experimental conditions, such as a snake or height stimulus in studies of blood phobics and controls.

Notes

[1] For the first 30 subjects only, BP was assessed during the 20 s prior to each stimulus onset, with the hope of using this measure as a baseline. This procedure was discontinued when it was discovered that the frequent cuff inflation was excessively uncomfortable for subjects and may have cued them as to the timing of stimulus onset. Discontinuation of this assessment occurred after an equal number of subjects (balanced for gender) from each group had completed participation and after each surgical stimulus had been presented an equal number of times. Therefore, no experimental confound occurred. The prestimulus BP data collected on the 30 subjects were not analyzed.

[2] Prior to Exposure 1, Video Only subjects were not presented any stimulus while the other groups were hearing their first preparation audiotape. It was originally intended that the lack of this stimulus presentation would permit the Video Only subjects to serve as a "waiting, no intervention control" for the auditory preparations presented to the other two groups.

[3] Since the Video Only Group received no preparation for the first exposure, their affect during Exposure 1 was compared with that of the other two groups during Test Trial 1. The Video Only Group did not differ from the Neutral Audiotape Group on any measures, and only differed from the Surgery Audiotape Group in having more frequent avoidance and "high" disgust.

[4] Affect differences between the Surgery and Neutral Audiotape Groups during the initial audiotape preparation per se were examined to determine whether hearing the surgery description led to greater negative affect than hearing the neutral, control description. As expected, Surgery Audiotape subjects reported more displeasure and arousal than Neutral Audiotape subjects (both $p < .0002$). Lack of control and SCL followed this same pattern, but neither reached statistical significance. Neither HR nor the two BP measures differed between groups during this preparation audiotape.

GENERAL DISCUSSION

An aversive negative reaction to blood, injury, or bodily deformation is a fairly common phenomenon traditionally termed "blood phobia" and classified as a simple phobia. Research has enlightened possible etiologies (Kleinknecht, 1987; Ost & Hugdahl, 1985), examined subjects' cognitions during exposure to blood-related stimuli (Kaloupek & Stoupakis, 1985; Kaloupek, Scott, & Khatami, 1985), and developed exposure-based techniques with modifications to prevent fainting (Ost & Sterner, 1987). Generally, however, it has been less researched than other simple phobias, perhaps because most authors view it as simply another phobia (Marks, 1988). Yet its unique features hinder straightforward extrapolation from the extensive theory and empirical literature on simple phobias.

A Comparison of Blood Phobia and Other Phobias

The literature on blood phobia has consistently used the term "fear" to describe the affect of phobics vis-a-vis blood-related stimuli. For example, the Mutilation Questionnaire is considered to measure respondent's "fear" of mutilation stimuli (Klorman et al., 1974). One wonders, however, what is it specifically that is feared? It is unlikely that the external blood-related stimulus itself is feared, for what damage or harm can it accomplish? Beck and

Emery (1985) noted that blood phobics do not report fear during actual confrontation with the stimulus, rather, they feel queazy, disgusted, or squeamish. Additionally, the facial expression exhibited by the blood phobics in the current study was routinely one of disgust rather than fear. Thus, it appears that the subjective experience of blood phobics is complicated, possibly encompassing fear prior to or early during exposure, but that another affect such as disgust is dominant during exposure. More detailed study of the subjective emotional experience of blood phobics both before and during exposure is worthwhile.

The psychophysiology of blood phobia is thought to be unique among phobias. In other simple phobias, exposure to the phobic stimulus results in a prolonged sympathetic response with classic markers of fear and anxiety such as tachycardia, hypertension, and increased sweating and respiration rate. Yet blood phobia is considered to have a biphasic response pattern of sympathetic activation followed by parasympathetic activity which, if exposure is continued, leads to fainting. Research indicates that fainting is uniquely associated with blood phobia and not with other phobias (Connolly, Hallam, & Marks, 1976), and many researchers suggest that most blood phobics faint (Marks, 1988). Yet of the 84 blood phobics participating in both studies, none fainted nor appeared to near faint during exposure to the surgeries.

There are several potential reasons for the discrepancies between the current studies and past research. It is possible that these subjects were not sufficiently phobic, and that more severe blood phobics would have fainted. Several clinical studies have found about a 70% prevalence of fainting in the histories of blood phobics presenting for treatment (Ost, Sterner, & Lindahl, 1984; Connolly et al., 1976; Thyer et al., 1985). However, generalizations from clinic patients to all blood phobics may not be appropriate. It is also possible that the stimuli used in the current studies were insufficiently aversive either due to the content or duration. In vivo exposure to an operation or undergoing venipuncture and blood donation probably are more aversive and likely to elicit fainting (Graham et al., 1961). Regarding stimulus duration, brief exposures to mutilation stimuli resulted in tachycardia but not significant bradycardia in Study 1 and in studies by Klorman et al. (1975, 1977). Longer duration presentations (Ost et al., 1984; Steptoe & Wardle, 1988) more frequently find parasympathetic activity and fainting. Thus, longer stimulus presentations may permit the occurrence of the parasympathetic portion of the biphasic reaction, whereas shorter presentations permit only sympathetic activity.

It is possible, however, that fainters constitute a distinct group, only partially overlapping with blood phobics. Kleinknecht and Lenz (1989) recently found that

the population of people who report fear to blood stimuli can be subdivided into fainters and nonfainters, and that some fainters report little or no fear of blood stimuli. This apparently accounts for Kleinknecht's (1988a) earlier finding of only a modest correlation ($\underline{r}$ = .30) between MQ scores and a history of fainting to blood-injury stimuli. Thus, aversion or fear of blood-related stimuli appears to be less tightly associated with fainting than an examination of clinic blood phobics and blood donation fainters would lead one to believe. Alternatively, Kleinknecht's blood phobics and those in the current studies were college students and younger than patients in the above clinical studies. It is possible that these subjects were unsure whether or not they would faint, because they too rarely have encountered blood-related stimuli or because they reliably escape or avoid. Future research might find that if such people were to continue exposure to a sufficiently intense blood-related stimulus, perhaps most or all would faint. Thus, an important area of research is an evaluation of the extent of fainting among blood phobics, those situations in which fainting occurs, and the differences between fainters and nonfainters.

Behavioral avoidance testing to assess the motoric fear response is commonplace in studies of simple phobias. With blood phobia, however, only Ost's research team has used a behavioral measure: duration of viewing a prolonged surgery film. Blood phobia may differ from other phobias in that

the physical distance from the stimulus appears to be less important than duration of eye contact with the stimulus (Beck & Emery, 1985). Closing one's eyes and looking away appear to be effective escape and avoidance behaviors, but it is the rare study that has assessed these affect indices (Hare et al. 1971), although some have monitored eye contact via the electrooculogram for the purpose of ascertaining compliance with viewing (Klorman et al., 1975, 1977). In the current studies, videotaping the subject's observing behavior and coding eye contact were fairly simple procedures which provided data not only on viewing compliance but also on behavioral avoidance; this measure showed some discriminatory power as a dependent measure. Thus, it is recommended that future studies which present visual stimuli monitor observing behavior, both to verify stimulus observation and to more fully assess emotion.

A second motor system dependent measure in these studies was the facial expression of affect. This dependent measure has rarely been assessed in studies of phobia, although there exists an impressive literature on facial expressions and emotions (Adelmann & Zajonc, 1989; Ekman & Oster, 1979). In the current studies, subjects either remained expressionless, or they displayed a characteristic expression of disgust which varied in intensity. The presence and intensity of this expression also proved quite useful as a dependent measure.

In summary, several differences between blood phobia and other simple phobias have been noted in the literature and found in the current studies. First, the dominant emotion during exposure to blood-related stimuli may not be fear, as it apparently is in other simple phobias, but probably disgust, at least as assessed thus far via facial expressions and verbal reports. Second, at least some blood phobics display the unique biphasic psychophysiologic reaction of sympathetic followed by parasympathetic activity and associated fainting. It is unclear what factors predispose to this physiological reaction, but it is not found in other simple phobias. Third, effective avoidance and escape behaviors include not only increasing the physical distance from the stimulus, but averting eye contact with the stimulus, a behavior with questionable efficacy in other phobias. Finally, although not addressed in these studies, blood phobics appear to have a much higher percentage of biological relatives with the same condition than is found for the other simple phobias (Marks, 1987).

Despite these differences, researchers continue to consider blood phobia as another simple phobia (e.g, Marks, 1988). This may occur because of key similarities between blood phobia and other phobias. In both cases, a physical stimulus elicits a temporary aversive reaction which gives rise to escape and future avoidance behavior. Yet this pattern is seen also in other conditions not considered phobias such as learned taste aversions in which contact

with the aversive substance elicits disgust and avoidance behavior consisting predominantly of preventing sensory contact with the offensive agent rather than maximizing physical distance (De Silva & Rachman, 1987; Garcia, Kimmeldorf, & Koelling, 1955).

Although blood phobia is similar to other simple phobias in the eliciting stimuli and superficial overt motor responses, differences appear to exist in subjective experience, psychophysiology, facial expression, successful escape and avoidance behaviors, and family patterns. Thus, blood phobia may be fundamentally different from other simple phobias (Thyer et al., 1985) and may be more akin to an aversion. An interesting study that might elucidate the relationship between these blood and simple phobias would be to study multiphobic subjects--those who manifest both blood phobia and another common simple phobia, such as snake phobia. Presenting such subjects both phobic stimuli while assessing multiple response systems would help to determine how blood phobia differs, while controlling for all individual differences. Another interesting research venue is to clarify similarities and differences between aversions and blood phobia.

Unanswered Questions

The studies in this dissertation shed some light on blood phobia but also served to illuminate its vast darkness of unanswered questions. First, little is known about how blood phobics differ from nonphobics. It is inadequate

simply to state that they have learned to fear a certain stimulus. Rather, an understanding of that learning process and of the many environmental and individual differences that influence and maintain the phobia is needed. For example, the current studies suggest that blood phobics are more sensitive to their own bodily reactions, they more easily experience distress at the emotional pain of others, and they have greater generalized fear and insecurity than nonphobics. Yet there are no differences in certain aspects of empathy and classical neurotic features such as increased muscle tension and autonomic arousal. Most prior studies that have examined the differences between blood phobics and nonphobics have not been guided by theory (see Kleinknecht & Lenz, 1989, for an exception). Future studies should seek to provide a comprehensive description of blood phobics by testing predictions of theoretical models such as Engel's (1978) via questionnaires and/or behavioral assessments of relevant personality attributes.

Although a host of stimuli including injury, bodily deformation, illness, pain, and needles in addition to blood appear to elicit the blood phobic reaction, little or no research has examined the effects of different stimuli or individual differences in what is considered aversive. The following is hypothesized. The ultimate stimulus which elicits the reaction is the personalized image that one's own body is unnaturally and dangerously injured. The greater the imagined injury and danger, the more distressed

the subject will be. External stimuli will correlate along a continuum with this personalized image and will evoke corresponding degrees of anxiety. For example, the sight of blood pouring from a wound might be more highly correlated with this "dangerous injury" affective network than the sight of an amputated leg. The latter stimulus might elicit greater anxiety than a healing scar. Such a priori predictions based on injury severity and imminent danger will permit testing of the hypothesis.

Other stimulus and personality dimensions call for study. One interesting observation is that some blood phobics have greater aversion to their own injury or blood, while other phobics are more distressed by that of another person. The processes involved in such differences need exploration. Manipulation of the similarity of the "victim" to the subject (e.g, human vs. animal, gender, race) might reveal insights. Additionally, some aspect of the naturalness or unnaturalness of the blood-related stimulus might influence responding; one wonders whether blood associated with childbirth or menstruation elicit the same reaction as blood from an unnatural source (e.g., wound). Clearly, these many research domains can be fruitful to furthering our understanding not only about blood phobia, but also about important psychological processes such as empathy, fantasy, imagery, and emotion.

APPENDIX A

INFORMED CONSENT TO PARTICIPATE IN RESEARCH (STUDY 1)

J. HILLIS MILLER HEALTH CENTER
UNIVERSITY OF FLORIDA
GAINESVILLE, FLORIDA 32610

You are being asked to volunteer as a participant in a research study. This form is designed to provide you with information about this study and to answer any of your questions.

1. TITLE OF RESEARCH STUDY

Exposure to Visual and Verbal Stimuli

2. PROJECT DIRECTORS

Name: Barbara G. Melamed, Ph.D.
Mark A. Lumley, M.S.

Telephone Number: 392-0295
or 392-4551

3. THE PURPOSE OF THE RESEARCH

The purpose of this study is to learn how people react to seeing and hearing different sorts of scenes presented by videotape and audiotape. A second goal is to see how personality differences relate to how people react to these videotapes and audiotapes.

4. PROCEDURES FOR THIS RESEARCH

The study will take place during one 1 hour session. When you arrive at the Behavioral Medicine Laboratory, you will complete several questionnaires about different aspects of your personality. Next, heart rate and skin conductance sensors will be connected to your hand and arms to produce a record of physiological activity. There is no pain or discomfort in applying or recording with these sensors. A blood pressure cuff will be connected to your upper arm, and it will inflate and deflate automatically every few minutes. You will then be asked to watch several short videotapes on a television. Some of the videotapes may include scenes such as everyday activities, whereas other videotapes may

show part of a surgery on a person. After viewing the videotapes, you will wear headphones through which you will hear short descriptions. The audiotapes may describe scenes such as an operation or some everyday activity. Exactly what sorts of videotapes and audiotapes you are presented will depend on the experimental group to which you will be randomly assigned. After each presentation, you will rate how you felt using a computer rating system, and you will complete a questionnaire. During the videotape and audiotape presentations, your body's reactions will be recorded and your behavior will be videotaped. After the presentations, you will be interviewed briefly about your feelings about the presentations, and then you will be dismissed.

Feel free to ask questions about the study. You may withdraw from the study at any time for any reason without a penalty. All questionnaires, videotapes, and other materials will remain confidential, and you will be identified only by number and not by your name. All information will be destroyed after the data have been analyzed.

5. POTENTIAL RISKS OR DISCOMFORTS

We expect there to be little risk from participating in this study. However, some people might feel some discomfort or lightheadedness from watching or listening to some of the video or audiotapes. However, these symptoms are known to be short-lived. If you wish to discuss these or any other discomforts you may experience, you may call the Project Director listed in #2 of this form.

6. POTENTIAL BENEFITS TO YOU OR TO OTHERS

You will be paid for participation when you complete the study. Additionally, as a student in the psychology subject pool, you have the opportunity to learn about how psychology research is conducted. Society and science also may benefit from your participation. This research will help us better understand why people react differently when they see and hear a variety of types of material.

7. ALTERNATIVE TREATMENT OR PROCEDURES, IF APPLICABLE

Not applicable

APPENDIX B

SUBJECT INSTRUCTIONS (STUDY 1)

The purpose of this study is to learn how people react when they see and hear different types of scenes presented by videotape and audiotape. In addition, I want to see how people's personalities as reported by questionnaires relate to how they react to these videotapes and audiotapes. In a few moments, this television in front of you will present several short videotapes. Some videotapes may show everyday, commonplace scenes, whereas others may show scenes such as a surgical operation on a person's chest. For all presentations, there is a picture on the television but there is no sound. Whenever the television turns on, you should watch the presentation until it is over. Please try your best not to look away or close your eyes. It is very important that you watch the entire presentation. Immediately after each presentation ends, your blood pressure will be taken, and this computer screen will turn on so that you can rate how you felt during the presentation. I will explain how to use the computer in a few moments. After you have finished rating the feelings you had during the presentation, I will step back in the room and have you fill out a short questionnaire before the next presentation. After several television presentations, I will have you wear a pair of headphones, and you will hear some descriptions over the headphones. After each headphone description, you will rate how you felt during the description. When the headphone presentations are over, I will talk with you briefly about how you felt about the presentations, and then you can leave. I'll pay you as you leave.

To determine how you react to the television presentations and the headphone presentations, I am going to record your body's responses. Let me attach the recording sensors right now.

(ATTACH HR AND SCL LEADS, BP CUFF)

The blood pressure cuff will inflate before and after each television and or headphone presentation.

(PRESENT SAM INSTRUCTIONS: APPENDIX C)

Let me tell you the order of things that will happen. In a few moments, I am going to go into the other room. The first thing that will happen is that the computer screen will turn on. Please watch for the computer to turn on. When it does, I would like you to rate how you are feeling right then; that is rate your feelings as you sit there waiting for the television presentations to start.

Remember, you will rate how happy vs. unhappy, calm vs. aroused, in control vs. controlled, and how faint and how sick or nauseas you are feeling right then. After you are done rating, please be still and wait patiently for about a minute. Please watch for the television to turn on. After the first television presentation, the computer screen will turn on and you should rate how you felt while you watched the presentation. After you have made your ratings, I will come back into the room to have you complete another questionnaire. Then we will repeat the same procedure for another television presentation, and so on. Do you have any questions?

(CONDUCT FIRST TWO TRIALS USING VIDEOTAPE STIMULI: AFTER TRIAL 2, CONTINUE WITH INSTRUCTIONS:)

In a moment I'll have you put these headphones on. This part of the study will proceed just like the first part, except that you will hear descriptions over the headphones rather than see anything on the television. The descriptions may be about things such as a surgery on a person's chest or about everyday activities. When the headphones turn on, I want you to listen very carefully to what the person is describing, and think about it. After the headphone presentation ends, your blood pressure will be taken, and you should use the computer screen to rate how you felt during that headphone presentation. I'll come back in after the first headphone presentation. Do you have any questions?

APPENDIX C

SELF-ASSESSMENT MANIKIN (SAM) INSTRUCTIONS

In addition to your physiological responses, I'm interested in your emotional feelings that you experienced while you watched the television or listened to the headphones. Right now I'll show you how to use the computer to rate your feelings. To rate your emotions, a stick figure called SAM will be presented on this computer screen (POINT). SAM's features can be adjusted using this black knob (POINT) to represent your feelings on three dimensions: happy vs. unhappy, calm vs. aroused, and in control vs. controlled. Right now, I'll turn on the screen and go into the other room to start the demonstration. Watch the screen turn on and I'll be right back to show you how to use the control box and the screen. I'm also going to take your blood pressure again.

(TURN ON SAM BOX, MONITOR, GO TO OTHER ROOM, ASSESS BP, HIT SHIFT, RETURN TO SUBJECT ROOM)

When the screen first turns on, you'll see this message, "Please center the ratings knob." First, let me explain how to do this. To center the knob, turn the knob first one way and then the other and watch the screen as you do. You can turn it quickly, but don't force it too hard because it could break. You will know when the knob is centered because this message will disappear and the screen will list the emotion which you are going to rate. The first emotion that you will practice rating this time is happy vs. unhappy. Go ahead and center the knob by turning it one way or the other, and notice the happy vs. unhappy label on the screen. (PAUSE)

This is SAM. Let me tell you about the happy vs. unhappy scale. First, turn the knob all the way to the right. At this end of the scale, you felt completely HAPPY, PLEASED, SATISFIED, CONTENTED, HOPEFUL. This is the way SAM should look if you felt completely contented or happy during the presentation. Now let's look at the opposite feeling from pleasure-at the other end of the scale. Turn the knob to the left. This is the way SAM should look if you felt completely UNHAPPY, ANNOYED, UNSATISFIED, DEPRESSED, DESPAIRING. Now <u>slowly</u> turn the knob back all the way to the other end. Notice that SAM's expression changes gradually, allowing you to show exactly how happy vs. unhappy you felt, not just only one extreme or the other.

OK, let's practice. Have SAM show me that you felt completely DISSATISFIED and DEPRESSED during a presentation. (PAUSE) Good! Show me that you felt completely HAPPY AND

HOPEFUL. (PAUSE) Let's try some less extreme feelings. How would SAM look if you felt somewhat UNHAPPY or ANNOYED? (PAUSE) How about if you felt mostly CONTENTED AND PLEASED. (PAUSE) Good, notice that SAM can show extreme feelings and all the small differences in between.

When you have positioned the knob so that SAM exactly represents how happy vs. unhappy you felt during the preceding presentation, you should push the red button on the control box so that the computer records your rating. This also advances the screen. Go ahead and push the red button. (PAUSE)

Again, you see the message to center the knob. This time when you do it, you will see the second type of feeling that SAM can represent, "calm vs. aroused." Watch the screen as you center the knob. (PAUSE) Turn the knob all the way to the right. At this end of the calm vs. aroused scale you had feelings such as: STIMULATED, EXCITED, FRENZIED, JITTERY, WIDE-AWAKE, AROUSED. If you felt most jittery and wide awake, SAM should look like this. Now let's look at the opposite feeling from arousal--at the other end of the scale. Turn the knob all the way to the left. This is the way SAM should look if you felt completely: RELAXED, CALM, SLUGGISH, DULL, SLEEPY, UNAROUSED. Now, slowly turn the knob all the way to the other end, and notice the changes in SAM'S stomach and eyes.

Now have SAM show that you felt completely RELAXED AND UNAROUSED. (PAUSE) Now have SAM show that you felt completely WIDE-AWAKE AND AROUSED. (PAUSE) Let's try some moderate feelings. If you felt somewhat JITTERY; (PAUSE) if you felt moderately CALM. (PAUSE) Once again you should try to rate exactly how you felt using any part of the scale. When SAM represents exactly how calm vs. aroused you felt during a presentation, push the red button to record your feeling. Go ahead and push it.

The next emotion that you will rate is "in control vs. controlled." First, center the knob. Now turn it all the way to the right. At this extreme of the scale you have feelings characterized as controlling, INFLUENTIAL, IN CONTROL, IMPORTANT, DOMINANT, AUTONOMOUS. If you felt most influential and in complete control, SAM should look like this. Now let's look at the opposite feeling from being in control. This is the way SAM should look if you felt completely: CONTROLLED, INFLUENCED, CARED-FOR, SUBMISSIVE, GUIDED, UNIMPORTANT. Notice that SAM is large when you felt important and influential, and that SAM is very small when you felt submissive and guided. Make SAM show that you felt completely CONTROLLING and DOMINANT. (PAUSE) Now make SAM show that you felt completely SUBMISSIVE and CONTROLLED. (PAUSE) Again, try rating some of your moderate feelings of control: if you felt only moderately SUBMISSIVE OR INFLUENCED, (PAUSE) or just slightly DOMINANT AND INFLUENTIAL. (PAUSE) Once again press the red button after you have made SAM represent exactly how in control vs. controlled you felt.

The last two ratings you will make do not involve SAM, but are ratings of how faint and how nauseous or sick to your stomach you might have felt during the television or headphone presentation. The first rating scale is the faintness rating. First center the knob. Use the knob to position the arrow at the appropriate point on the scale of faintness. You can place the arrow at either end or any point in between to rate your feelings of faintness during the presentation. After positioning the arrow, press the red button. Now center the knob. Next comes the rating of nauseous feelings. Position the arrow to rate how nauseous or sick to your stomach you felt during the presentation. Again, use any part of the scale. When you have positioned the arrow to represent how nauseous you felt, then press the red button. The computer will turn off, and then I'll come back into the room.

In summary, the computer will turn on after each television and headphone presentation. The 3 SAM ratings will be first, although the computer will present them in different orders each time. First center the knob, and then use the knob to make SAM represent how you felt during the preceding presentation. Press the red button to record your feeling. After the three SAM ratings, you should then rate the faintness and nauseous feelings experienced during the presentation.

Do you have any questions about the computer?

APPENDIX D

DEBRIEFING FORM (STUDY 1)

This study is now over, and I thank you very much for your participation. This form is intended to explain further the purpose of the study.

My research team is interested in better understanding the reaction that some people have when they see something bothersome, such as blood or injuries, and in what ways these people differ from others who are not particularly bothered by these sights. Furthermore, we are trying to understand how people's negative feelings can be reduced so that they are not bothered by seeing blood and injuries. This study involved showing you both a surgery videotape and a neutral videotape in order to compare your reactions to these two types of material. If you find blood-related things to be bothersome, we hypothesized that your reaction would be stronger to the surgery videotape than to the neutral videotape, and that it would be stronger when viewing the surgery videotape in comparison to people who report less of a problem with seeing blood-related things. If you are not particularly bothered by blood-related sights, we hypothesized that your reaction would not differ between the two tapes. In addition, we are interested in seeing if the same pattern of responding occurs when you hear rather than see the presentations. Thus, half of the research participants heard a tape describing an operation, and the other half heard a neutral description. Finally the questionnaires will be used to determine what personality attributes are related to how people react when they see and hear surgery and neutral scenes.

Because of the nature of the experiment, please <u>DO NOT DISCUSS</u> this study with any of your classmates. They may be participating later, and their knowledge about the study might invalidate the results. I appreciate your participation. Please ask any questions and tell me your thoughts before you leave.

______________________	______________________
Signature of Subject	Date
______________________	______________________
Signature of Experimenter	Date

APPENDIX E

PHOBIC AND NEUTRAL AUDIOTAPE TRANSCRIPTS (STUDIES 1 AND 2)

Fear Scene 1 (Studies 1 and 2): "Incision"

The surgeon holds a scalpel which is pulled slowly across the patient's chest leaving a thin red mark where the skin is cut. Blood drips from the cut. Again, the scalpel is pulled slowly to make the incision wider and longer across the chest. The inside of the wound reveals yellow tissue. The scalpel is drawn a third time across the incision, which is pulled open several inches wide. Next, large metal cutters are placed in the incision. A small retractor holds the wall of the incision open. The surgeon forcefully squeezes the cutters to snip the tough muscle or bone which covers the chest cavity. Again, the surgeon squeezes the cutters several times to make more cuts through the muscle. Next, the surgeon holds the incision open with a finger, and sharp scissors are used to snip the remaining muscle tissue. The wound now reveals the interior of the chest cavity where moist, pink-colored lungs slowly inflate and deflate.

Fear Scene 2 (Study 2): "Rib"

Red muscle surrounds the patient's rib. The surgeon's hands use a sharp needle to clean tissue from the rib. The rib is cleaned and small blood drops are wiped with a cloth. Next, the surgeon forcefully pushes a flat metal tool down the length of the rib to remove muscle from the rib. The tool is pushed up the rib to remove more tissue and then is pushed down again. Next, the tool is slid underneath the rib from top to bottom to clean off muscle from below. Finally, only the ends of the rib remain connected to the patient's body. Next, cutters are squeezed around the rib's upper end, and the rib is cut and twisted off. The cleaning tool is slid down underneath the rib. The cutters snip the rib at the lower end and twist it free from the body. Blood oozes from the wound, and a cloth is placed in the wound to stop the bleeding.

Fear Scene 3 (Study 2): "Heart"

The patient's heart, covered with yellow fat, beats rapidly within the red, muscular chest walls. The surgeon pokes a thin, sharp needle into the beating heart. Forceps are pushed deep into this hole, and blood flows from the wound. The surgeon's finger is placed over the hole in the heart. Sharp scissors snip an artery, and blood squirts from the cut. While the heart beats, a tube is pushed into the hole. Blood leaks from the hole. The surgeon squeezes pliers attached to the tube, and then removes the tube from the heart. The surgeon's apron has red stains on it. The surgeon's finger is removed from the heart, and streams of blood squirt with each heartbeat. The surgeon's replaces the finger over the hole to stop the bleeding. Forceps insert a needle and thread around the hole as blood continues to squirt. The surgeon ties the thread around the hole. The heart is cleaned with cloth and continues beating.

Fear Scene 4 (Studies 1 and 2): "Tubes"

The patient's chest is open, revealing internal organs. The surgeon grips the side of the wound, stretching the skin, and uses a scalpel to make two small incisions in the patient's abdomen. The scalpel makes the incisions deeper and wider. The surgeon then forces long, sharp scissors down into one incision. The scissors are turned and pushed until forced into the chest cavity. A white tube is attached to the scissors and pulled back through the incision. Several feet of tube are pulled from the chest out through the abdomen. The surgeon then forces the scissors through the other incision into the chest cavity. A second white tube is attached and pulled back through the abdomen. The abdomen skin is forcefully pulled away from the underlying muscle. Pliers push a metal needle and thread through the chest wall. The needle is pushed into the opposing muscle wall and pulled through. The lungs slowly inflate and deflate within the chest cavity.

Fear Scene 5 (Study 2): "Sutures"

The surgeon uses forceps, a needle, and thread to stitch the patient's chest incision, which is several inches wide. The surgeon pushes the needle through a muscle and pulls it through the other side. The needle is pushed through another muscle. This is repeated several times while the surgeon holds the bloody muscle tissue. Next, the stitches are all in place, but are not tightly pulled together. The lungs continue to inflate and deflate. The surgeon squeezes the pliers to pull the walls of the incision together. Two red muscles are brought together over the surface of the incision. Forceps push a needle and thread through each muscle and pull the thread to bring the

muscles together. Next, all the muscles in the incision are joined together. The surgeon ties the thread several times and pulls other threads to further close the skin. Several more knots are made before the thread are cut. A cloth is placed in the wound.

Neutral Scene (Study 1): "Truck"

The toy blue truck is made of wood. A trailer connected to it is also constructed of wood and painted blue. The trailer carries several yellow blocks. The truck is slowly pushed up the long white ramp until it reaches the top, where it is pushed straight ahead. The toy truck is stopped, and one yellow block is moved from the front to the back of the trailer. All six blocks are then straightened out. The truck is gradually pushed up another ramp as the blue wheels rotate slowly. The truck is stopped and three more yellow blocks are gently placed on the trailer, one at a time. The truck is pushed again, this time, down the ramp. As it reaches the bottom, it turns slightly before stopping. One block is removed and is placed on the floor. A second block is also removed and placed on top of the first. Finally, two more blocks are picked up and removed from the truck.

Neutral Scene 1 (Study 2): "Cake"

The baker slowly tips the box, and yellow cake mix pours into the large bowl. The baker taps the bottom of the box and more yellow mix falls into the bowl. Next, the baker takes a large egg from an egg carton. The egg is gently tapped against the bowl until a crack appears in the shell. The baker gently pulls the egg apart, and the egg white and yolk drop into the bowl. The baker takes a spatula and pokes the egg yolk causing the yellow liquid to flow from it. The baker then stirs the mix by quickly rotating the spatula. The spatula turns in one direction and then in the other. Next, the baker holds a measuring cup in one hand and, with the other hand, pours some clear oil from a plastic bottle. The baker tips the measuring cup to pour the oil into the mixing bowl. The spatula is used to stir the mix again.

Neutral Scene 2 (Study 2): "Typewriter"

The secretary sits in front of an electric typewriter. A blank sheet of white paper is lifted up to the typewriter roller and gently placed down against the left edge marker. The secretary's hand slowly twists the knob at the end of the roller until the paper is securely locked and reappears in front of the typewriter keys. The secretary's fingers rest briefly on the keys and then begin to move, first hitting this key, then that one, and many in succession. Occasionally, the space bar is pressed. Gradually the

typing approaches the right side of the paper. The secretary's hand presses the return key, and the typing head automatically moves back to the other side. The secretary's hand returns to the original position and begins typing again. The fingers continue pressing and moving for several minutes. Next, the secretary slowly rotates the knob and removes the paper from the typewriter. The secretary places the paper down on the desk.

Neutral Scene 3 (Study 2): "Garden"

The gardener is kneeling in the garden between two rows of brown dirt. Nearby is a yellow plastic cup which holds several short, green plants. The gardener's hand digs a small hole, several inches deep, in one of the rows of dirt. One plant is taken from the plastic cup, and the roots are shaken gently. The plant is dropped to the bottom of the hole, and using the other hand, the gardener pushes the dirt back into the hole to cover the roots. Next, the gardener reaches for a metal watering can, and tips the spout of the can toward the plant. Clear water pours quickly onto the dirt all around the plant. The gardener gently sets the watering can down and pushes more dirt around the plant's base. The gardener moves several inches to the left and proceeds to make another small hole in the brown dirt. The next plant is taken from its cup for this spot.

Neutral Scene 4 (Study 2): "Canoe"

The shiny silver canoe floats gently down the river. The canoeist sits quietly in the back of the canoe. The old wooden paddle is held firmly in the canoeist's hands. First, the paddle is moved to the right side of the canoe and placed in the water to the top of the blade. It is slowly pulled back, forcing the water before it and gradually pushing the canoe forward. When the paddle has travelled several feet, the canoeist leaves it there for several seconds. Next, the canoeist picks up the paddle and brings it forward. Drops of water fall from the blade. The paddle is moved across the canoe to the other side, and the canoeist's hands switch position on the paddle. Now, the right hand holds the top and the left hand the bottom. The canoeist reaches the paddle forward and places it into the water for another stroke. The canoeist pulls the paddle and the canoe moves forward.

Neutral Scene 5 (Study 2): "Kite"

A warm breeze blows across the park. A person quickly walks toward the center of the park, gradually unrolling a ball of string. At the other end of the string is a big blue and red kite, lying on the ground. The person continues to unroll several more feet of string and then stops walking and firmly grasps the ball of string. After

several seconds, the person's hands and arms pull the string, and the person moves several feet further away from the kite. The kite rises in the air. The person stops moving and slowly unrolls the ball of string, watching the kite rise above the trees. After several minutes, the breeze begins to fade, and the person stops releasing string. As the kite begins to fall, the person's right hand quickly begins to twirl the string around the ball, retrieving the slack in the string. After several moments, the person stops twirling the string and watches the kite.

APPENDIX F

VPM CONTROL PROGRAM FOR DATA ACQUISITION AND STIMULUS PRESENTATION (STUDY 1)

```
title     vpm control file for Lumley's dissertation study 1
include          macros.vpm
include          constnts.vpm
;
;       one millisec time base
;
BEGINDCA 1000,0,30000,CGA,CGA,ANALOG,2047,LABMASTER
;
comment %
Control file to run exposure paradigm for Lumley's
dissertation study 1 using the VPM and the IBM PC-AT
%
;
jump    start
;
;;;;;;;;;;;;;;;;;;;
;  timing durations
;;;;;;;;;;;;;;;;;;;
;
fiftyeightsec:  dw      58000
thirtysec:      dw      30000
twentysixsec:   dw      26000
twentysec:      dw      20000
tenhalfsec:     dw      10500
fourhalfsec:    dw      4500
twohalfsec:     dw      2500
tenth:          dw      100
shifts:         dw      3
temp:           dw      ?
vidbit:         dw      2; video is bit 1 of Digital Output
zero:           dw      0
three:          dw      3
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;       sampling table
;       channel 1: Skin Conductance
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
scltable:
  storagetable  1      ;sample 1 channels
  storagerow    1, 100 ;skin conductance, channel 1 at 10 HZ
;
```

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;       fainting/nausea rating definitions
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
faintleft:          dw      2;# lines in left message
                    defmsg  "Not at all"
                    defmsg  "faint"
faintright:         dw      2 ;# lines in right message
                    defmsg  "Extremely"
                    defmsg  "faint"
faintcntr:          dw      2 ;# lines in center message
                    defmsg  "How faint did you feel during"
                    defmsg  "the last presentation?"
nauseleft:          dw      2;# lines in left message
                    defmsg  "Not at all"
                    defmsg  "nauseous"
nauseright:         dw      2 ;# lines in right message
                    defmsg  "Extremely"
                    defmsg  "nauseous"
nausecntr:          dw      2 ;# lines in center message
                    defmsg "How nauseous did you feel during"
                    defmsg  "the last presentation?"
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
; messages to the experimenter
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
mwait:              defmsg  "hit SHIFT twice to start a trial"
massessbp:          defmsg  "assess blood pressure"
mbaseSAM:           defmsg  "hit SHIFT to start baseline SAM"
mstartaudio:        defmsg  "start AUDIOtape presentation"
mstartvideovcr:     defmsg  "start VIDEOtape;RECORD small VCR"
mstimpres:          defmsg  "stimulus being presented"
mexpdone:           defmsg  "experiment completed"
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;   This is a macro which runs the trial structure
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
runloop         macro
collect:
                upcount
                clockreset
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;strike SHIFT key twice to start the next trial
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
                message         mwait
waitloop:
                delay           tenth
                peek            kbdstat, 0, temp
                BITmask         shifts, temp
                jumpeq          zero, temp, waitloop
```

```
waitlloop:
                delay           tenth
                peek            kbdstat, 0, temp
                BITmask         shifts, temp
                jumpeq          zero, temp, waitlloop
                message         massessbp
                delay           thirtysec
                jumpeq          @usrcnt, three, startl
                dcstart
                delay           twentysixsec
                message         mstartvideovcr
                delay           fourhalfsec
                dcstop
                jump            go
startl:         dcstart
                delay           twentysec
                message         mstartaudio
                delay           tenhalfsec
                dcstop
go:             dcstart
                message         mstimpres
                delay           fiftyeightsec
                message         massessbp
                delay           twohalfsec
                dcstop
;
                portout     vidbit, 71DH;gate for Ss monitor
                samrate     zero
                linerate    faintleft, faintright, faintcntr, 1
                linerate    nauseleft, nauseright, nausecntr, 2
                portout     zero, 71DH
                write
                jumplt          @usrcnt, three, collect
                endm            ; end macro
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;  begin executable commands here
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
start:
          seta2drange  0,1 ;for skin conductance and heart
          seta2dstore     scltable
          asemask      1   ;read HR on digital input port A-0
          setcount        zero
          message         mbaseSAM
```

```
wait2loop:
         delay           tenth
         peek            kbdstat, 0, temp
         BITmask         shifts, temp
         jumpeq          zero, temp, wait2loop
         portout         vidbit, 71DH  ;gate for Ss monitor
         samrate         zero
         linerate        faintleft, faintright, faintcntr, 1
         linerate        nauseleft, nauseright, nausecntr, 2
         portout         zero, 71DH
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;  collect 3 trials of data
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
         runloop
         message         mexpdone
         delay           twentysec
         enddca
vpm      ends
         end
```

APPENDIX G

INFORMED CONSENT TO PARTICIPATE IN RESEARCH (STUDY 2)

J. HILLIS MILLER HEALTH CENTER
UNIVERSITY OF FLORIDA
GAINESVILLE, FLORIDA 32610

You are being asked to volunteer as a participant in a research study. This form is designed to provide you with information about this study and to answer any of your questions.

1. TITLE OF RESEARCH STUDY

Exposure to Visual and Verbal Stimuli

2. PROJECT DIRECTORS

Name: Barbara G. Melamed, Ph.D.
Mark A. Lumley, M.S.

Telephone Number: 392-0295
or 392-4551

3. THE PURPOSE OF THE RESEARCH

You have been asked to participate in this research because you have reported that you find the sight of blood and injuries to be discomforting. The purpose of this study is to learn how people respond to scenes which they find to be aversive, such as an operation in which there is blood. In addition, we will learn what are the best ways of presenting the scenes in order to help people be more comfortable with observing this type of material.

4. PROCEDURES FOR THIS RESEARCH

The study will take place during one two-hour session. When you arrive at the Behavioral Medicine Laboratory, the study procedure will be explained to you, and you will be asked to sign this Informed Consent Form. You will be briefly interviewed about your history of reactions to blood-related things and will complete a number of questionnaires about your thoughts and feelings on several topics. Following this, you will be seated in a viewing room where heart rate and skin conductance sensors will be

connected to your hand and arms to produce a record of physiological activity. There is no pain or discomfort in applying or recording with these sensors. A blood pressure cuff will also be connected to your upper arm. It will inflate and deflate automatically every minute or two. You will then rate your feelings using a picture rating system on a video screen. While you remain seated, you will be asked to watch a number of short segments of surgical operations on a person's chest. You may also hear over headphones a description of surgery or a description of some everyday activity. Each videotape and auditory presentation will be separated by a short rest period. During each presentation, your body's reactions will be recorded and your behavior will be videotaped. After each presentation, you will rate how you are feeling. After a number of such presentations, the study will be over and you will be free to leave. You may be contacted by telephone after several months to see whether the experimental participation has had any affect on your reactions to blood-stimuli encountered in your daily life.

Feel free to ask questions at any time. You may withdraw from the study at any time for any reason without a penalty. All questionnaires, videotapes, and other materials will remain confidential, and you will be identified only by number and not by your name. All information will be destroyed after the data have been analyzed.

5. POTENTIAL RISKS OR DISCOMFORTS

We expect there to be little risk from this study. However, you have reported that you find blood-related stimuli to be aversive; therefore, you might sense some discomfort, lightheadedness, nausea, and possibly even faintness from viewing the videos. However, these symptoms are known to be short-lived.

If you wish to discuss these or any other discomforts you may experience, you may call the Project Director listed in #2 of this form.

6. POTENTIAL BENEFITS TO YOU OR TO OTHERS

Both you and society stand to benefit from your participation in this study. You will learn more about the blood aversiveness condition which you report having, and your participation may help you feel more comfortable when seeing blood-related things.

Society and science also may benefit from your participation in that this research will show us how to help people become less afraid or concerned with situations that they typically avoid because of the fear of feeling too uncomfortable. Therefore, more people may be able to donate blood, help others who are injured, and feel comfortable going to the doctor or dentist. Additionally, this research

will help us know which types of people will benefit most from which type scene presentation.

7. ALTERNATIVE TREATMENT OR PROCEDURES, IF APPLICABLE

If you want treatment for aversion to blood-related stimuli or any other problems, you have the option of being seen as an outpatient at the Psychology Clinic.

APPENDIX H

SUBJECT INSTRUCTIONS (STUDY 2)

The goal of this study is to better understand people's reactions to seeing and hearing things about blood, injury, or illness. Furthermore, we hope to learn about the process by which people become more comfortable seeing such things. Several times during your participation today, this television in front of you will present a short videotape showing part of a surgical operation on the chest of a living human being. At other times, it is possible that you will hear a description of the surgery over these headphones, or you may hear a description of an everyday activity. You definitely will see part of a surgery on the television, however, whether or not you hear anything over the headphones and what you hear will depend on which experimental group you will be assigned to.

At various times today, the television will turn on and show a one minute presentation of a surgery on a person's chest. There is a picture but no sound during the presentation. Whenever the television turns on, you should watch the surgery until it is over. Please try your best not to look away or close your eyes. Although it might be difficult, try to continue watching until the 60-second presentation ends. Immediately after it ends, your blood pressure will be taken, and this computer screen will turn on so that you can rate how you felt during the presentation. I will explain how to use the computer to make these ratings in a few moments. After you have finished rating the feelings you had during the presentation, you should wait a few moments and remain ready for the next presentation, which could be either a television or a headphone presentation.

At other times, the headphones may present a description without the television turning on. If the headphones turn on, listen very carefully to what is being described and think about it. After 60 seconds, the headphone presentation will end, and your blood pressure will be taken. The computer screen will turn on, and you should rate how you felt during the headphone presentation. Then wait and remain ready for the next presentation.

To determine how you react to the television and headphone presentations, your body's responses are being recorded with the sensors and the cuff. The blood pressure cuff will inflate at various times during your participation. Please do not be alarmed when it inflates. In addition to your physiological responses, we are

interested in the emotional feelings you experienced while you watched the television or listened to the headphone presentation. I will now show you how to use the computer to rate how you felt during a television or headphone presentation.

(PRESENT SAM INSTRUCTIONS: APPENDIX C)

In order to familiarize you with the procedure, we will have a practice television presentation of a scene from nature. With the exception that you will not be seeing a surgery this time, this practice trial will be just like the television presentations later. The practice scene will start in a few moments, so please watch the television and then use the computer to rate how you felt while watching the presentation. Any questions that you have about the procedure will be answered after that.

(PRESENT PRACTICE TRIAL; ANSWER SUBJECT'S QUESTIONS)

In just a few seconds, you will hear through the headphones a brief set of instructions about the study. Right after that, the computer screen will turn on. Use the computer to rate how you felt during the headphone presentation. After that, you should wait several minutes before the surgery or everyday activity television and headphone presentations begin. Remember that after each presentation, you should use the computer to rate how you felt during that presentation.

Audiotaped headphone reminders (played via cassette):

In a few minutes the television presentations of a surgery on the chest of a living human being and the headphone descriptions of surgery or an everyday activity will begin. Whenever the television shows an operation, you should continue to watch it for the entire time that it is displayed. Please do not close your eyes or look away. It is very important to the success of this study that you continue to watch the surgery for as long as it is on. Again, after the television turns off, you should rate how you felt during the presentation. At other times, the headphones may turn on. Please listen carefully and think about what is being described. After the description is over, you should rate how you felt during the description.

After you make your ratings, please wait for a few moments until the videotape or headphone turns on again for the next presentation. You will have a number of these presentations until the study is over. The presentations will begin in a few minutes.

APPENDIX I

DEBRIEFING FORM (STUDY 2)

This study is now over, and I thank you very much for your participation. This form is intended to explain further the purpose of the study.

My research team is interested in better understanding ways to reduce people's fear of or concern with blood-related sights in order to help them cope with situations they normally avoid, such as watching an operation. As a general rule, repeated exposure to upsetting things is the most effective way of becoming more comfortable around these things. That is why I repeatedly showed you the same surgical videotape. I compared three different ways of presenting such material. Some subjects saw a surgical videotape repeatedly. Other subjects saw a surgical videotape on some occasions, but heard a description of the surgery on other occasions. The remaining subjects saw a surgical videotape but also heard a neutral, "everyday activity" description at the same time that other subjects were hearing a surgical description; these subjects served as experimental "controls" for hearing something over the headphones. (Your group assignment was determined randomly and in no way reflects on your personality). During these exposures, I monitored how your body was reacting and how you were feeling. I want to see if people show less discomfort with more exposures and to determine differences in the speed of becoming more comfortable for the three conditions. Also, a different surgery tape was presented at the end in order to determine the degree to which the change affected your reactions to seeing new blood-related things.

Because of the nature of the experiment, please do not discuss this study with any of your classmates. They may be participating later, and their knowledge about the study might invalidate the results. I appreciate your participation. Please ask any questions and tell me your thoughts before you leave.

______________________________ ______________________________
Signature of Subject Date

______________________________ ______________________________
Signature of Experimenter Date

APPENDIX J

VPM CONTROL PROGRAM FOR DATA ACQUISITION AND STIMULUS PRESENTATION (STUDY 2)

```
title       vpm control file for Lumley's dissertation study 2
include         macros.vpm
include         constnts.vpm
;
;       one millisec time base
;
BEGINDCA        1000,0,30000,CGA,CGA,ANALOG,2047,LABMASTER
;
comment %
Control file to run exposure paradigm for Lumley's
dissertation study 2 using the VPM and the IBM PC-AT
%
jump    start
;
;;;;;;;;;;;;;;;;;;;;;;;;
;       timing durations
;;;;;;;;;;;;;;;;;;;;;;;;
;
onemin:         dw      60000
fiftyeightsec   dw      58000
fortysec:       dw      40000
thirtysec:      dw      30000
twentysec:      dw      20000
twelvesec:      dw      12000
tensec:         dw      10000
ninesec         dw      9000
eightsec:       dw      8000
threesec:       dw      3000
twosec:         dw      2000
onesec:         dw      1000
tenth:          dw      100
shifts:         dw      3
temp:           dw      ?
itis:           dw      25000, 20000, 30000, 22500, 35000
                dw      17500, 32500, 15000, 27500
ititmp:         dw      10
vidbit:         dw      2 ;video bit is bit 1 of Dig Output
zero:           dw      0
one:            dw      1
two:            dw      2
three:          dw      3
four:           dw      4
```

```
five:           dw      5
six:            dw      6
seven:          dw      7
eight:          dw      8
nine:           dw      9
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;       sampling table
;       channel 1: Skin Conductance
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
scltable:
  storagetable  1      ; sample 1 channels
  storagerow    1, 100 ;skin conduct on channel 1 at 10 HZ
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;       fainting/nausea rating definitions
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
faintleft:           dw      2;# lines in left message
                     defmsg  "Not at all"
                     defmsg  "faint"
faintright:          dw      2 ;# lines in right message
                     defmsg  "Extremely"
                     defmsg  "faint"
faintcntr:           dw      2 ;# lines in center message
                     defmsg  "How faint did you feel during"
                     defmsg  "the last presentation?"
nauseleft:           dw      2;# lines in left message
                     defmsg  "Not at all"
                     defmsg  "nauseous"
nauseright:          dw      2 ;# lines in right message
                     defmsg  "Extremely"
                     defmsg  "nauseous"
nausecntr:         dw      2 ;# lines in center message
                   defmsg "How nauseous did you feel during"
                   defmsg  "the last presentation?"
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;messages to the experimenter
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
massessbp:      defmsg "assess blood pressure"
massessbp1:     defmsg "assess BP; prepare to start stimulus"
massessbp2:     defmsg  "assess BP; STOP stimulus, VCR"
mstartprep:     defmsg  "start AUDIOtape or present nothing"
mstartaudio:    defmsg  "start AUDIOtape presentation"
mstartvideo:     defmsg "start experimental VIDEOtape"
mstartvideovcr: defmsg "start VIDEOtape; RECORD on sm VCR"
mratings:         defmsg  "ratings being conducted"
mexpdone:         defmsg  "experiment completed"
mtrialsgo:     defmsg  "press SHIFT to begin trial"
miti1:       defmsg "ITI; preparation trial, disconnect SAM?"
miti2:        defmsg  "ITI; prepare experimental stimulus"
```

```
miti3:          defmsg  "ITI; prepare novel stimulus"
miti4:          defmsg  "ITI; prepare visual stimulus"
mstimpres:      defmsg  "stimulus being presented"
mbase:     defmsg  "BASELINE recordings; Prepare to hit BP"
msignals:  defmsg  "check signals--SHIFT starts baseline"
mdemoratings:   defmsg  "demonstrate ratings to subject"
msessionbase:   defmsg  "presession baseline"
mquestions:   defmsg  "answer questions--SHIFT to continue"
minstr:       defmsg  "play instructions--SHIFT starts SAM"
mpause:         defmsg  "10 seconds pause before baseline"
moff:           defmsg  "  "
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;   This is a macro which runs the trial structure
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
runloop        macro     ;beginning of macro definition
collect:
            upcount
            clockreset
            jumpeq          @usrcnt, one, start1
            jumpeq          @usrcnt, three, start2
            jumpeq          @usrcnt, five, start2
            jumpeq          @usrcnt, seven, start2
            jumpeq          @usrcnt, nine, start3
            jump            start4
start1:     message         miti1
            jump            go
start2:     message         miti2
            jump            go
start3:     message         miti3
            jump            go
start4:     message         miti4
go:         get             itis, 2, ititmp, 0
            delay           ititmp
            get             itis, 2, ititmp, 0
            delay           ititmp
            message         mtrialsgo
;
:;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;waiting for SHIFT key to be struck to start pretrial
;baseline recordings and start trial
;:;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
wait5loop:
      delay           tenth
      peek            kbdstat, 0, temp
      BITmask         shifts, temp
      jumpeq          zero, temp, wait5loop
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;data collection and messages to experimenter
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
```

```
        dcstart
        message         mbase
        delay           twentysec
        dcstop
        message         massessbp1
        dcstart
        delay           ninesec
        jumpeq          @usrcnt, one, here
        jumpeq          @usrcnt, two, here1
        jumpeq          @usrcnt, four, here1
        jumpeq          @usrcnt, six, here1
        jumpeq          @usrcnt, eight, here1
        jumpeq          @usrcnt, nine, here1
        jump            here2
here:   message         mstartprep
        delay           threesec
        jump            here3
here2:message           mstartaudio
        delay           threesec
        message         mstartvideo
        jump            here3
here1:delay             threesec
        message         mstartvideovcr
here3:delay             eightsec
        dcstop
        message         mstimpres
        dcstart
        delay           fiftyeightsec
        message         massessbp2
        delay           twosec
        dcstop
        delay           onesec
        portout         vidbit, 71DH ;open gate for Ss monitor
        samrate         zero
        linerate        faintleft, faintright, faintcntr, 1
        linerate        nauseleft, nauseright, nausecntr, 2
        portout         zero, 71DH
        write
        jumplt          @usrcnt, nine, collect
        endm            ; end macro
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;       begin executable commands here
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
start:
      seta2drange     0,1 ;for skin conductance and heart
      seta2dstore     scltable
      asemask         1  ;read HR on digital input port A-0
      setcount        zero
;
```

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;program is waiting for experimenter to check signal quality
;prior to starting presession baseline affective and physiol
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
     message     mquestions
wait1loop:
     delay       tenth
     peek        kbdstat, 0, temp
     BITmask     shifts, temp
     jumpeq      zero, temp, wait1loop
     message     minstr
     delay       onesec
wait2loop:
     delay       tenth
     peek        kbdstat, 0, temp
     BITmask     shifts, temp
     jumpeq      zero, temp, wait2loop
     portout     vidbit, 71DH ;release gate for Ss monitor
     samrate     zero
     linerate    faintleft, faintright, faintcntr, 1
     linerate    nauseleft, nauseright, nausecntr, 2
     portout     zero, 71DH
     message     mpause
     delay       tensec
 ;
 ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
 ;   this is a one-minute presession physiology baseline
 ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
 ;
     message         massessbp
     delay           twentysec
     message         msessionbase
     dcstart
     delay           onemin
     dcstop
     write
     message         massessbp
     delay           twentysec
 ;
 ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
 ; collect 9 trials of data with var iti between trials
 ;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
 ;
     runloop
     message         mexpdone
     delay           twentysec
     enddca
vpm  ends
     end
```

APPENDIX K

ORDER EFFECTS (STUDY 1)

Table 11. Study 1 Change in Displeasure During the Surgery and Neutral Videotapes for Phobics and Nonphobics by Order of Videotape Presentation

	Videotape Stimulus			
	Surgery		Neutral	
	M	(SD)	M	(SD)
Phobics	9.7	(4.6)	-0.7	(2.6)
Surgery first	11.8	(3.8)	-0.8	(2.7)
Neutral first	7.7	(4.6)	-0.6	(2.5)
Nonphobics	2.8	(3.8)	-0.3	(3.2)
Surgery first	1.5	(3.7)	-0.1	(3.8)
Neutral first	4.1	(3.6)	-0.5	(2.6)

Table 12. Study 1 Mean Heart Rate Change During the Surgery and Neutral Videotapes for Phobics and Nonphobics by Order of Videotape Presentation

	Videotape Stimulus			
	Surgery		Neutral	
	M	(SD)	M	(SD)
Phobics	2.1	(12.2)	0.4	(3.9)
Surgery first	7.8	(14.1)	0.9	(2.8)
Neutral first	-3.5	(6.5)	0.0	(4.7)
Nonphobics	-2.1	(5.2)	-1.7	(5.3)
Surgery first	-0.7	(4.3)	-3.0	(5.5)
Neutral first	-3.6	(5.7)	-0.4	(5.1)

APPENDIX L

ANOVA TABLES (STUDIES 1 AND 2)

Study 1: Affect Across Surgery and Neutral Videotapes

Pleasure:

Between Subjects Effects

	df	MS	F	p
Group	1	253.50	15.31	.0003
Order	1	4.17	0.25	.62
Surgery	1	0.67	0.04	.84
Group X Order	1	54.00	3.26	.08
Group X Surgery	1	4.17	0.25	.62
Order X Surgery	1	0.67	0.04	.84
Group X Order X Surgery	1	0.00	0.00	1.00
Error	40	16.56		

Within Subject Effects

	df	MS	F	p
Video	1	1092.50	118.32	.0001
Video X Group	1	322.67	34.91	.0001
Video X Order	1	2.67	0.29	.59
Video X Surgery	1	13.50	1.46	.23
Video X Group X Order	1	80.67	8.73	.005
Video X Group X Surgery	1	20.17	2.18	.15
Vidoe X Order X Surgery	1	0.00	0.00	1.00
Video X Group X Order X Surgery	1	4.17	0.45	.51
Error	40	9.24		

Arousal:

Between Subjects Effects

	df	MS	F	p
Group	1	140.17	2.65	.11
Order	1	6.00	0.11	.74
Surgery	1	8.17	0.15	.69
Group X Order	1	40.04	0.76	.38
Group X Surgery	1	30.37	0.58	.45
Order X Surgery	1	345.04	6.54	.014
Group X Order X Surgery	1	150.00	2.84	.10
Error	40	52.79		

Within Subject Effects

	df	MS	F	p
Video	1	2053.50	152.82	.0001
Video X Group	1	198.37	14.76	.0004
Video X Order	1	7.04	0.52	.47
Video X Surgery	1	26.04	1.94	.17
Video X Group X Order	1	24.00	1.79	.19
Video X Group X Surgery	1	6.00	0.45	.51
Vidoe X Order X Surgery	1	0.17	0.01	.91
Video X Group X Order X Surgery	1	18.37	1.37	.25
Error	40	13.44		

Control:

Between Subjects Effects

	df	MS	F	p
Group	1	173.34	4.47	.04
Order	1	36.26	0.93	.34
Surgery	1	0.26	0.01	.93
Group X Order	1	23.01	0.59	.44
Group X Surgery	1	17.51	0.45	.51
Order X Surgery	1	86.26	2.22	.14
Group X Order X Surgery	1	3.01	0.08	.78
Error	40	38.80		

Within Subject Effects

	df	MS	F	p
Video	1	906.51	58.04	.0001
Video X Group	1	380.01	24.33	.0001
Video X Order	1	17.51	1.12	.30
Video X Surgery	1	41.34	2.65	.11
Video X Group X Order	1	15.84	1.01	.32
Video X Group X Surgery	1	0.01	0.00	.98
Vidoe X Order X Surgery	1	3.01	0.19	.66
Video X Group X Order X Surgery	1	5.51	0.35	.56
Error	40	15.62		

Skin Conductance Level:

Between Subjects Effects

	df	MS	F	p
Group	1	2.91	2.66	.11
Order	1	1.26	1.16	.29
Surgery	1	0.50	0.46	.50
Group X Order	1	4.03	3.69	.06
Group X Surgery	1	4.69	4.30	.044
Order X Surgery	1	0.00	0.00	.95
Group X Order X Surgery	1	0.34	0.31	.58
Error	40	1.09		

Within Subject Effects

	df	MS	F	p
Video	1	32.30	36.12	.0001
Video X Group	1	2.89	3.23	.08
Video X Order	1	3.39	3.79	.058
Video X Surgery	1	1.19	1.33	.26
Video X Group X Order	1	2.51	2.81	.10
Video X Group X Surgery	1	3.34	3.74	.06
Vidoe X Order X Surgery	1	0.43	0.49	.49
Video X Group X Order X Surgery	1	0.00	0.00	.97
Error	40	0.89		

Heart Rate:

Between Subjects Effects

	df	MS	F	p
Group	1	249.53	4.90	.032
Order	1	231.77	4.55	.039
Surgery	1	11.60	0.23	.63
Group X Order	1	211.96	4.16	.048
Group X Surgery	1	154.91	3.04	.09
Order X Surgery	1	74.64	1.46	.23
Group X Order X Surgery	1	144.98	2.84	.099
Error	40	50.97		

Within Subject Effects

	df	MS	F	p
Video	1	9.65	0.32	.57
Video X Group	1	28.09	0.94	.34
Video X Order	1	381.35	12.79	.0009
Video X Surgery	1	146.51	4.92	.032
Video X Group X Order	1	33.16	1.11	.29
Video X Group X Surgery	1	359.89	12.07	.001
Vidoe X Order X Surgery	1	4.74	0.16	.69
Video X Group X Order X Surgery	1	36.42	1.22	.27
Error	40	29.81		

Systolic Blood Pressure:

Between Subjects Effects

	df	MS	F	p
Group	1	157.59	1.80	.19
Order	1	168.01	1.92	.17
Surgery	1	36.26	0.41	.52
Group X Order	1	21.09	0.24	.63
Group X Surgery	1	128.34	1.47	.23
Order X Surgery	1	14.26	0.16	.69
Group X Order X Surgery	1	23.01	0.26	.61
Error	40	87.52		

Within Subject Effects

	df	MS	F	p
Video	1	49.59	0.91	.34
Video X Group	1	0.09	0.00	.97
Video X Order	1	27.09	0.50	.48
Video X Surgery	1	21.09	0.39	.54
Video X Group X Order	1	1.26	0.02	.88
Video X Group X Surgery	1	46.76	0.86	.36
Vidoe X Order X Surgery	1	1.26	0.02	.88
Video X Group X Order X Surgery	1	27.09	0.50	.48
Error	40	54.28		

Diastolic Blood Pressure:

Between Subjects Effects

	df	MS	F	p
Group	1	3.76	0.07	.79
Order	1	201.26	3.98	.053
Surgery	1	0.09	0.00	.96
Group X Order	1	114.84	2.27	.14
Group X Surgery	1	2.34	0.05	.83
Order X Surgery	1	128.34	2.54	.12
Group X Order X Surgery	1	0.26	0.01	.94
Error	40	50.62		

Within Subject Effects

	df	MS	F	p
Video	1	27.09	0.39	.53
Video X Group	1	14.26	0.20	.65
Video X Order	1	61.76	0.88	.35
Video X Surgery	1	0.09	0.00	.97
Video X Group X Order	1	8.76	0.13	.72
Video X Group X Surgery	1	36.26	0.52	.47
Vidoe X Order X Surgery	1	137.76	1.97	.17
Video X Group X Order X Surgery	1	12.76	0.18	.67
Error	40	69.97		

Study 1: Affect During Audiotape Trial (between subjects)

Pleasure:

	df	MS	F	p
Audio	1	200.08	12.55	.001
Group	1	33.33	2.09	.16
Order	1	14.08	0.88	.35
Surgery	1	0.08	0.01	.94
Audio X Group	1	126.75	7.95	.01
Audio X Order	1	0.33	0.02	.88
Audio X Surgery	1	1.33	0.08	.77
Group X Order	1	4.08	0.26	.62
Group X Surgery	1	0.08	0.01	.94
Order X Surgery	1	0.00	0.00	1.00
Audio X Group X Order	1	5.33	0.33	.57
Audio X Group X Surgery	1	0.00	0.00	1.00
Audio X Order X Surgery	1	0.75	0.05	.83
Group X Order X Surgery	1	8.33	0.52	.47
Audio X Group X Order X Surgery	1	4.08	0.26	.62
Error	32	15.94		

Arousal:

	df	MS	F	p
Audio	1	776.02	27.03	.0001
Group	1	58.52	2.04	.16
Order	1	20.02	0.70	.41
Surgery	1	15.19	0.53	.47
Audio X Group	1	4.68	0.16	.69
Audio X Order	1	22.68	0.79	.38
Audio X Surgery	1	1.69	0.06	.81
Group X Order	1	0.02	0.00	.98
Group X Surgery	1	6.02	0.21	.65
Order X Surgery	1	295.02	10.28	.003
Audio X Group X Order	1	0.19	0.01	.94
Audio X Group X Surgery	1	31.69	1.10	.30
Audio X Order X Surgery	1	3.52	0.12	.73
Group X Order X Surgery	1	46.02	1.60	.21
Audio X Group X Order X Surgery	1	35.02	1.22	.27
Error	32	28.71		

Control:

	df	MS	F	p
Audio	1	352.08	19.38	.0001
Group	1	6.75	0.37	.55
Order	1	5.33	0.29	.59
Surgery	1	10.08	0.56	.46
Audio X Group	1	192.00	10.57	.003
Audio X Order	1	2.08	0.11	.74
Audio X Surgery	1	5.33	0.29	.59
Group X Order	1	60.75	3.34	.07
Group X Surgery	1	12.00	0.66	.42
Order X Surgery	1	44.08	2.43	.13
Audio X Group X Order	1	12.00	0.66	.42
Audio X Group X Surgery	1	6.75	0.37	.54
Audio X Order X Surgery	1	21.33	1.17	.29
Group X Order X Surgery	1	0.00	0.00	1.00
Audio X Group X Order X Surgery	1	10.08	0.56	.46
Error	32	18.17		

Skin Conductance Level:

	df	MS	F	p
Audio	1	1.08	5.06	.031
Group	1	0.02	0.11	.74
Order	1	0.09	0.42	.52
Surgery	1	0.30	1.40	.24
Audio X Group	1	0.47	2.18	.15
Audio X Order	1	0.00	0.00	.96
Audio X Surgery	1	0.29	1.40	.24
Group X Order	1	0.19	0.89	.35
Group X Surgery	1	0.00	0.00	.96
Order X Surgery	1	0.45	2.12	.15
Audio X Group X Order	1	0.19	0.92	.34
Audio X Group X Surgery	1	0.06	0.29	.59
Audio X Order X Surgery	1	0.16	0.73	.39
Group X Order X Surgery	1	0.35	1.62	.21
Audio X Group X Order X Surgery	1	0.70	3.24	.08
Error	32	0.21		

Heart Rate:

	df	MS	F	p
Audio	1	0.01	0.00	.97
Group	1	1.19	0.07	.80
Order	1	41.14	2.49	.12
Surgery	1	57.18	3.46	.07
Audio X Group	1	32.41	1.96	.17
Audio X Order	1	4.45	0.27	.61
Audio X Surgery	1	1.77	0.11	.74
Group X Order	1	0.00	0.00	.99
Group X Surgery	1	17.10	1.04	.32
Order X Surgery	1	3.24	0.20	.66
Audio X Group X Order	1	1.77	0.11	.74
Audio X Group X Surgery	1	0.00	0.00	1.00
Audio X Order X Surgery	1	18.04	1.09	.30
Group X Order X Surgery	1	36.75	2.23	.14
Audio X Group X Order X Surgery	1	6.13	0.37	.55
Error	32	16.51		

Systolic Blood Pressure:

	df	MS	F	p
Audio	1	46.02	0.56	.46
Group	1	17.52	0.21	.64
Order	1	35.02	0.43	.52
Surgery	1	9.18	0.11	.74
Audio X Group	1	50.02	0.61	.44
Audio X Order	1	0.52	0.01	.94
Audio X Surgery	1	38.52	0.47	.50
Group X Order	1	17.52	0.21	.65
Group X Surgery	1	38.52	0.47	.50
Order X Surgery	1	1.69	0.02	.89
Audio X Group X Order	1	31.69	0.39	.54
Audio X Group X Surgery	1	325.52	3.99	.054
Audio X Order X Surgery	1	20.02	0.25	.62
Group X Order X Surgery	1	117.18	1.44	.23
Audio X Group X Order X Surgery	1	77.52	0.95	.33
Error	32	81.62		

Diastolic Blood Pressure:

	df	MS	F	p
Audio	1	15.18	0.39	.54
Group	1	0.18	0.00	.94
Order	1	1.02	0.03	.87
Surgery	1	50.02	1.28	.26
Audio X Group	1	22.69	0.58	.45
Audio X Order	1	15.19	0.39	.53
Audio X Surgery	1	25.52	0.65	.42
Group X Order	1	1.02	0.03	.87
Group X Surgery	1	0.19	0.00	.94
Order X Surgery	1	0.19	0.00	.94
Audio X Group X Order	1	6.02	0.15	.70
Audio X Group X Surgery	1	9.18	0.24	.63
Audio X Order X Surgery	1	17.52	0.45	.51
Group X Order X Surgery	1	4.69	0.12	.73
Audio X Group X Order X Surgery	1	7.52	0.19	.66
Error	32	38.98		

Study 2: Affect of Video Only Group Across Eight Trials

Pleasure:

	df	G-G df	MS	F	p	G-G p
Trial	7	3.2	38.92	8.61	.0001	.0001
Error	133	60.3	4.52			

Arousal:

	df	G-G df	MS	F	p	G-G p
Trial	7	2.8	106.11	10.34	.0001	.0001
Error	133	52.6	10.26			

Control:

	df	G-G df	MS	F	p	G-G p
Trial	7	3.0	80.32	7.76	.0001	.0002
Error	133	56.7	10.35			

Skin Conductance Level:

	df	G-G df	MS	F	p	G-G p
Trial	7	2.6	3.94	4.28	.0003	.012
Error	133	49.1	0.92			

Heart Rate:

	df	G-G df	MS	F	p	G-G p
Trial	7	3.9	37.58	1.35	.23	.26
Error	133	74.5	27.74			

Systolic Blood Pressure:

	df	G-G df	MS	F	p	G-G p
Trial	7	2.9	57.33	0.97	.46	.41
Error	133	56.1	59.33			

Diastolic Blood Pressure:

	df	G-G df	MS	F	p	G-G p
Trial	7	4.2	20.96	0.62	.74	.66
Error	133	79.4	34.08			

Study 2: Comparison between Surgery Audiotape and Neutral Audiotape Preparation Groups

Pleasure:

Between Subjects Effects

	df	MS	F	p
Group	1	453.00	4.40	.042
Error	38	102.87		

Within Subject Effects

	df	G-G df	MS	F	p	G-G p
Trials	4	3.4	40.79	10.57	.0001	.0001
Trials X Group	4	3.4	5.39	1.40	.23	.24
Error	152	127.8	3.86			

Arousal:

Between Subjects Effects

	df	MS	F	p
Group	1	14.04	0.09	.76
Error	38	157.02		

Within Subject Effects

	df	G-G df	MS	F	p	G-G p
Trials	4	3.3	202.04	19.27	.0001	.0001
Trials X Group	4	3.3	11.08	1.06	.38	.37
Error	152	126.0	10.48			

Control:

Between Subjects Effects

	df	MS	F	p
Group	1	320.04	2.02	.16
Error	38	158.18		

Within Subject Effects

	df	G-G df	MS	F	p	G-G p
Trials	4	2.7	114.28	14.04	.0001	.0001
Trials X Group	4	2.7	13.87	1.70	.15	.17
Error	152	102.3	8.14			

Skin Conductance Level:

Between Subjects Effects

	df	MS	F	p
Group	1	7.34	2.73	.107
Error	38	2.69		

Within Subject Effects

	df	G-G df	MS	F	p	G-G p
Trials	4	2.5	6.22	12.68	.0001	.0001
Trials X Group	4	2.5	0.54	1.10	.36	.35
Error	152	94.4	0.49			

Heart Rate:

Between Subjects Effects

	df	MS	F	p
Group	1	0.45	0.01	.92
Error	38	55.89		

Within Subject Effects

	df	G-G df	MS	F	p	G-G p
Trials	4	3.7	26.29	2.22	.069	.073
Trials X Group	4	3.7	19.60	1.66	.16	.17
Error	152	142.7	11.82			

Systolic Blood Pressure:

Between Subjects Effects

	df	MS	F	p
Group	1	55.12	0.15	.70
Error	38	362.55		

Within Subject Effects

	df	G-G df	MS	F	p	G-G p
Trials	4	3.2	124.72	1.70	.15	.17
Trials X Group	4	3.2	148.90	2.03	.092	.109
Error	152	131.1	73.23			

Diastolic Blood Pressure:

Between Subjects Effects

	df	MS	F	p
Group	1	19.22	0.15	.70
Error	38	127.29		

Within Subject Effects

	df	G-G df	MS	F	p	G-G p
Trials	4	2.0	49.56	1.01	.41	.37
Trials X Group	4	2.0	11.41	0.23	.92	.79
Error	152	75.6	49.25			

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BIOGRAPHICAL SKETCH

Mark Allan Lumley was born on June 4, 1962, in Detroit, Michigan. The third son of a Presbyterian minster and a schoolteacher/homemaker, Mark graduated from Temple Christian High School in 1980 as valedictorian and class president. He enrolled at Wayne State University in Detroit, where he was fully supported for five years by a Merit Scholarship. He earned two Bachelor of Science degrees, in biology and in psychology with honors. Other achievements during his undergraduate tenure included acceptance in Phi Beta Kappa, excellence citations in French and organic chemistry, research experiences with several professors in the Department of Psychology, and research traineeship for two summers at Henry Ford Hospital's Sleep Disorder Center. Mark graduated with Highest Academic Distinction from Wayne State in May, 1985, and he matriculated into the doctoral program in the Department of Clinical and Health Psychology at the University of Florida in Gainesville. He was supported by the prestigious Presidential Graduate Research Fellowship for three years and by a research traineeship from the National Institute of Dental Research for a fourth year. He completed the Master of Science degree in December, 1987, under the supervision of Barbara G. Melamed, Ph.D, with a thesis entitled "Age,

Previous Experience, and Presurgical Behavior as Predictors of a Child's Reaction to Anesthesia Induction." While a graduate student, Mark published several articles, taught an undergraduate course on sleep and dreams, and developed clinical skills as a health psychologist. He completed a one-year predoctoral clinical internship in the Department of Psychiatry at Detroit's Henry Ford Hospital in August, 1990, concentrating on hospital consultation-liaison and on sleep disorders. Currently, he is a postdoctoral fellow at the Behavioral Medicine Program in the Department of Psychiatry at the University of Michigan in Ann Arbor. Mark married Sheryl Rene Livesey, an accountant, on May 3, 1986. They have twin sons, Ryan and Joshua, who were born on July 26, 1990.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Barbara G. Melamed, Chair
Professor of Clinical and Health Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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